John Scroggins

INSTALLING SuSE Linux

THE AUTHORITATIVE SOLUTION

Expert Advice Regarding

- Preparing your system for installation
- Installation and configuration
- System administration
- Package management
- Network connectivity

Includes SuSE Linux 6.3

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Installing SuSE Linux®

John Scroggins

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Installing SuSE Linux®

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Dedication

This book dedicated to my Mother-in-law Rachel Arviso.

"Old things have passed away, behold all thing have become new."

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CHAPTER 1

Assessing the Platform

The Linux kernel has made significant progress in the last two years. The problem of hardware detection and compatibility has been reduced, although not totally eliminated. SuSE Linux also is striving to stay on the cutting edge of Linux technology, so the current distribution contains one of the latest kernel versions, 2.2.13. This in and of itself should indicate that SuSE Linux is extremely serious about performance computing. In addition, all the latest device drivers are included, which means that typical installation problems are decreased.

It's a given that Linux can take on many tasks. Making sure that you have the right platform to support those tasks is critical. Due to the rise in popularity, Linux boxes are used for the following, just to name a few:

- Web servers
- Routers
- Mail servers
- Print servers
- IP masquerading boxes
- Firewalls
- Workstation applications

Each of these environments requires certain resources. The SuSE Linux 6.3 distribution includes the v2.2 kernel, which supports symmetrical multiprocessing that gives the capability to distribute workload evenly among two or more CPUs. This version also contains software to support Beowulf Clustering, parallel virtual machines (PVMs), and other cutting-edge technology. Obviously, a good look at hardware is in order.

Hardware Component Requirements

Linux has a reputation of being capable of running in a low hard disk space and in low memory environments. Recent improvements and a proven track record has upped the ante. Putting more applications and graphical interfaces in place requires more hard disk space allocations, thus requiring an appropriate increase in memory. The old 286 with 4Mb of memory will not support a GUI environment.

SuSE understands that, in addition to businesses, personal computing stands to gain greatly from the Linux explosion. For that reason, SuSE Linux is designed to run on standard Intel-based PCs and almost all the subsequent PC-compatible clones. All PC hardware components are not created equal, of course; there is always the potential for a snag. As hardware manufacturers become more aware that Linux is not going to disappear from the face of the computing scene, they will have a compelling reason to provide more support for hardware such as video cards, sound cards, modems, and networking gear.

The GUI environment is gaining more influence in the Linux camp, largely because some users utilized a windowed-type graphical interface prior to coming to Linux. Although the command line interface, (CLI) remains the favorite among veteran Linux users, GUI tools and application are developed in abundance. These programs are larger than their text-based equivalents, which can use more system resources. This, too, has had a significant effect on processor type and speed, hard disk space, and RAM memory.

Following is a review of essential hardware components, their differences, technological advances, their functions, and their level of compatibility with SuSE Linux.

For quick reference, I have separated the component groups and make note of hardware components that may (or may not) cause problems during your installation.

Processors

Linux originally was written as an operating system that could utilize the features of the Intel 80386. As time went on, the use of other IA-32 processors (including Intel's 80486, Pentium, PentiumPro, and Pentium II-III; Xenon; AMD's 5x86, K5, K6, and K6-2; and Cyrix's 6x86 series) have posed little or no problem due to the backward compatibility and unique similarities between the processors.

In Table 1.1, you will find a listing of processors and their compatibility with SuSE Linux 6.3:

Table 1.1 Processors and Compatibility

Processor Type	Name	Compatibility
Intel Processors		
i80286	286	No
i80386SX	386SX 386DX 486SLC	Yes
i80486DX	486DX 486SX 486DX2&4	Yes

Processor Type	Name	Compatibility
Pentium	Pentium Pentium MMX	Yes
Pentium	PentiumPro PII Celeron PIII	Yes
AMD Pentium Processors		
Pentium	K5 K6 K6-2	K5 may have FPU problems
Pentium	K6-3	Yes
Athlon	K-7	Yes
Cyrix Processors		
6x86	Cyrix MX/MXII	Yes, overheating problems and CPUid problems

Intel has made a name for itself, and the market shows it. The new Pentium III Xeon chips are extremely fast and UNIX/Linux-compatible. With clock speeds up to 733MHz and a 133MHz bus, the Pentium III is a real "smoker."

You will note from Table 1.1 that every Intel processor produced (except for the 80286) is compatible with SuSE Linux 6.3. For high-end servers, which run multiple Intel processors (such as the Pentium Pro and Xeon processors), support is built into the generic kernel. As Linux matures, SMP technology also will increase to help you stay on the bleeding edge of technology.

More information on Intel processors can be found at `http://www.intel.com`.

Advanced Micro Devices (AMD) has made an inroad for itself in the CPU production market by offering a less expensive processor. As you can see, 99% of AMD K-Series CPUs are compatible with SuSE Linux 6.3.

Another AMD processor, the K5, is a "maybe" due to the fact that, in certain cases, the FPU function is not up to par with Intel. If you plan to run intense graphics and 3D rendering, this may cause some problems down the line. The entire K6 series represents no problem when it comes to compatibility. AMD's new K7 Athlon processor is also compatible. For the budget-minded, this offers a great solution.

For more information and details on the AMD processors point your browser to `http://www.amd.com`.

Cyrix, another company that produces CPUs, now has fifth-generation technology. Today's computer market has a fair amount of these CPUs in circulation. Their offering is limited to the 6x86 series. The 6x86 chip has two configurations, the MI and MII, the only difference being, the MII chip contains an MMX type instruction set. With the latest kernel version, the processor should do well—the main complaint is that the CPU runs quite hot under constant load (with background processes, for example).

SuSE Linux and Cyrix chips are generally compatible. If you happen to run into any problems, you can search for additional details at `http://www.cyrix.com`. In addition, you can find a Linux/Cyrix 6x86 HOW-TO on optimization at `http://wauug.erols.com/~balsa/linux/cyrix/p11.html`.

When choosing a processor, keep a few things in mind. For starters, the minimum processor is a 386sx, which supports the minimum text mode system. If you plan to use the full features of SuSE, a Pentium machine with a processor speed of 133Mhz or so provides a good ballpark figure to see good performance. This doesn't rule out that P75 box or that 486dx 50MHz machine that's been lying around the garage: I'm the first to use an old box. If you're looking for high-performance computing, however, you're going to need some horsepower behind it.

Hard Disks

Data storage needs have increased in the past five years. The disk that you use may vary, from SCSI Raid array in your big server to (E)IDE hard disk in your workstations, among a hundred other possibilities. Table 1.2 lists some of the hard disks types and their compatibility with Linux.

Table 1.2 Supported Hard Disks

Manufacturer	Types	Compatibility
Conner	SCSI/-2Fast F/W IDE-AT	Conner 1060S have trouble with extfs2 and Linux
DEC	SCSI/-2Fast F/W	Yes
Fujitsu	SCSI/-2Fast IDE-AT	Yes
H-P	SCSI/-2Fast	Yes
IBM	SCSI/-2Fast F/W IDE-AT	Yes
Maxtor	SCSI IDE-AT EIDE-UDMA	Yes
Micropolis	SCSI/-2Fast DIF/WID IDE-AT	Certain disks have problems with Adaptec BusLogic Card
Quantum	SCSI/Ultra SCSI/-2Fast F/W IDE-AT Ultra IDE	Yes
Seagate	SCSI/ULTRA SCSI/-2Fast F/W IDE-AT EIDE-UDMA33/66	Yes
Sony	SCSI	Yes
Toshiba	SCSI IDE-AT NOTEBK-IDE	Yes
Western Digital	SCSI/UT/WIDE IDE-AT	May have a problem if a different manufacturer's disk is using the same IDE cable



NOTE

If you are using a UDMA66 disk, make sure that your current motherboard will allow the increased transfer rates. The BX chipset allegedly supports UDMA, but this may not hold true for all BX chipset boards. For more information on UDMA66, point your browser to `http://www.abit.com.tw/english/product/`.

Virtually every hard disk available on the market can be used with SuSE Linux. A few disks are not compatible, however; you can find this information at `http://www.linuxdoc.org/HOWTO/Hardware-HOTWO-14.html#ss14.1`.

Hard disks of more than 8 gigabytes (GB) may require additional set up information, which can be accessed at `http://www.linuxdoc.org/HOWTO/mini/Large-Disk.html`. This site will give you information on how to resolve some of the common problems associated with large hard disks.

With SuSE Linux, you will need at least 300MB of hard disk space available to install the system. A full install (with all the bells and whistles, plus the kitchen sink) will require 4GB of disk space. The default installation takes up 750MB of hard disk space. Make sure you have enough room.

Memory

RAM memory has been a sore spot for every computer user. The more RAM, the faster the system responds.

SuSE Linux is compatible with all types of memory, including Error Correcting Code (ECC)) memory for servers, Extended Data Output (EDO) memory, Fast Page Mode (FPM) memory, and the PC100 and PC133 memory that is now available for the PIII Xeon CPU applications. The kernel presently supports (after recompiling) up to 2GB of physical memory, and developments in this area are steady; the kernel version 2.4 will handle even more.

Sufficient physical memory will give you a tremendous advantage. The GUI environment available in SuSE Linux requires at least 16MB of physical memory and 32MB for fair to good performance. Again, more is better.

Memory also plays an important part in the SuSE Linux install. Yes, Linux does utilize swap space, but don't think that a large swap space will make up for RAM. I have an older P75 machine with 8MB of memory, and SuSE Linux will not install on this machine without activating swap space. I've run out of RAM, so to finish my install I must listen to the hard disk thrash as the data is swapped between the CPU and the disk. On the other hand, I can effortlessly install, run, and multitask with my 350MHz AMD K6-2 3D-Now notebook with 96Mb of RAM. I do 70% of my work on my mobile warrior, so if time is of the essence and speed is a necessity, a good amount of RAM is not a luxury. If you intend to use SuSE Linux in a business environment, budget for a large helping of RAM.

CD-ROM and Peripherals

The CD-ROM (Read Only Memory) might be your primary method of installation. The pressing question is, will Linux recognize your CD-ROM?

If you are installing SuSE Linux with either an ATAPI or a SCSI interface, you'll have no problems. The EIDE driver supports the ATAPI drives, and support for the Adaptec SCSI Hostadapter aic7xxx is included in the generic kernel.

Network Interface Cards

Network interface cards (NICs) are essential because they provide the capability to connect computers by way of an internal network (intranet) or through the use of a wide area network, such as the Internet.

SuSE Linux contains a vast array of network card drivers, ranging from the Intel EtherExpress to PCMCIA drivers. Following is a list of supported network cards:

AMD Lance and PCnet (At1500/NE2100)
AMD PCI PCnet (PCI bus NE2100)
Ansel Communications (EISA 3200)
Apricot Xen-II onboard Ethernet
AT-LAN-TEC/RealTek pocket adapter
AT1700
Cabletron E21xx
Compaq Netelligent 10/100 NetFlex3
Compex RL-100ATX
D-Link DE600/DE620 pocket adapter
DE425, DE434, DE435, DE450, DE500
DECchip Tulip (dc21x4x) PCI
DEPCA, DE10x, DE200-DE202, DE422
Digi Intl. RightSwitch SE-X
EtherWORKS 3 (DE203,DE204,DE205)
FMV-181-184
HP 10/100VG PCLAN (ISA, EISA, PCI)
HP PCLAN+ (27247B/27252A)
HP PCLAN 27245
ICL EtherTeam 16i/32 (experimental)
Intel EtherExpress 16/Pro/Pro 100
NE2000/NE1000 (ISA)
NE2000 (PCI)
NI5210
NI6510 (am7990 “lance” chip)
Packet Engines Yellowfin Gigabit
PCMCIA (generic) 3.0.14
RealTek RTL8129/8139
SMC 83c170 EPIC/100
SMC 9194
SMC Ultra/Ultra 32
VIA VT86c100a Rhine-II
Western Digital WD80x3

In Chapter 7, “SuSE Communication Features,” I will give you more information on NIC setup with SuSE’s setup utility, YaST2.

Modems

Modems are another means of connecting to a network. Whether they are analog dialup modems or ISDN modems, Linux supports a variety of them and works well with most hardware-controlled modems. If your modem is a WinModem or a type that relies on a software driver to operate, it will not be of any use to you. If you intend to connect by modem (possibly a DSL or cable modem), Chapter 7 will show you how.

Zip/Jaz drives

Zip/Jaz drives are also supported in the SuSE Linux kernel. The primary purpose of these drives is to store data on a removable media. This is convenient when moving data from work area to another. To use these devices, you must recompile the kernel to add the support drivers. Recompiling the kernel is covered in Chapter 9.

ORB Drive

Another optical drive, the ORB drive, also might be worth taking a look at. This drive is available as an external (paraport) or internal drive. It utilizes magneto-resistive (MR) technology, and its removable 2.2GB disks are infinitely rewritable, which might make it an alternative back-up drive solution. This drive is supported by the Linux kernel; for more details, point your browser to `http://www.xtremetech.com.au/ORB/orb.html` or `http://www.torque.net/parport/paride.html`.

Castlewood, the ORB drive manufacturer, can be reached at `http://www.castlewood.com`.

DVD Drive

SuSE Linux 6.3 also supports DVD units. The current Web site for this is `http://www.opendvd.org/linuxdvd.html`.

If you're planning to utilize one of these units, obtain the kernel patch from this URL and follow the installation instructions.

Tape Drives

A tape drive is another necessary piece of hardware because it allows the consistent backup of critical data. Travan, Colorado, and quite a few other companies manufacture tape drives.

Tape drives (including the Iomega 2GB and 5GB internal type) are supported in the kernel. The drivers are not initialized in the generic kernel and thus must be recompiled into the kernel.

Video Cards

Video cards are one of the touchiest support issues for the Linux community. For the maximum benefit in the GUI environment, video cards must perform at their best. Unfortunately, an impasse has always stood in the way of video card compatibility, and support from video card manufacturers has not been forthcoming until recently. Not every manufacturer is releasing its source code, but those who see the Linux market as viable are. Currently, SuSE has the up-to-date version of Xfree86 version 3.3.5, which supports Intel i810 chipsets, ATI Rage 128 chipsets, and Savage3D and Savage4. SuSE offers another advantage, advanced video configuration tools that will help to identify unknown video parameters.

Sound Cards

Sound cards such as Sound Blaster and Sound Blaster Live are other popular components. In the past, drivers for sound cards have been as scarce as video card drivers. This, too, is changing as sound card vendors are noticing more requests for Linux-supported drivers. At this time, however, SuSE does not support PCI sound cards. The sound driver packages available on SuSE must be configured and initialized to operate; this will be reviewed in Chapter 11, "Sound for SuSE Linux."

Printers

Printers can range from a small inkjet type to a networked form printer. Both Postscript and DeskJet printers are supported. Getting your local or remote printer going will be covered in Chapter 8, "Managing Users and Groups with YaST."

Monitors

Monitors, whether as small as 14-inch or as large as 21-inch, should pose no problems with SuSE Linux. You would do well to have the monitor's specs handy, but if not, the video detection utility will help. I strongly recommend that you have the specs available in case you have a monitor that is not listed on SuSE's hardware database.

COMPATIBILITY CONCERNS

An increasing number of computer users are trying Linux for the first time, or updating to a different distribution. Although all of them run on the Linux kernel, they include or exclude certain hardware support features. I hope you have a clearer idea of what it will require to extract the maximum performance from your system and SuSE 6.3.

You may be installing over another distribution or building a new box to test SuSE. All the information on hardware is current and reflects most of the leading-edge technologies. Hopefully this chapter refreshed your memory on certain things while also bringing to light other pointers. Linux still has some ground to cover before all the hardware on the market is compatible. Until then, hardware will need to be scrutinized, and every effort must be made to identify and catalog the components of each box.

For big business, it might prove easier to find the right hardware combination and clone it. This will eliminate some of the headaches involved in deploying a new operating system.

Portable users will be impressed (as I was) with the ease of installing and running SuSE. Configuring all the components is a snap.

Simply put, the ease of installation gap is narrowing, and Linux is easier to install than ever before. Finding the right distribution for you may be only a few keystrokes and mouse clicks away. If you have some reason to question compatibility of certain hardware components with SuSE Linux 6.3, point your browser to `http://cdb.suse.de.cdb_english.html`.

Assessment Summary

Taking a quick look back, you'll find that this chapter addressed most of your hardware issues. From CPUs to DVD drives, SuSE Linux will help you fill the bill. For more information, use the listed URLs—you'll find that the Web is a vast resource for Linux support. If you are moving from or upgrading to the current 6.3 version of SuSE Linux, save all current configuration information. You might notice that this is suggested more than once in the preliminary chapters—as an old saying goes, "An ounce of prevention is worth a pound of cure." The next step is installation, which is covered in the next chapter.

CHAPTER 2

Installing SuSE Linux

The one area that probably draws the most attention in Linux is the install program. Gauged by past experiences, there's no doubt that installation of earlier distributions could be painful and outright frustrating—the sight of more than 25 floppy disks still seems to strike fear in my heart.

Distribution installation has changed in many ways, however, with some using text-based installation and others using a GUI environment of some kind. The difference is controlled by the individual(s) packaging the software.

Red Hat Inc. led the way in providing a "user-friendly" semi-graphical install script, which was reminiscent of the old DOS setup program. This had a two-fold benefit: It eased the visual transition of non-UNIX/Linux users, thereby giving them access to this powerful operating system. It also allowed more experienced users to get more done because the install scripts took over some tedious keystroke duties.

SuSE's YaST (Yet another Setup Tool) utility was released in April 1995, capitalizing on the Red Hat installer development. SuSE observed the factors that worked and determined which could be tuned and tightened—as a result, the final product exhibits form and function. The SuSE view is clear: Developing a toolkit that integrates installation, updating, and system file configurations will decrease the new users' learning curve drastically. I've had an opportunity to install most major distributions, so when I say that YaST is effective, it's not a biased statement.

YaST is like a "Swiss knife"—you want to carry it everywhere. It's a knife, cork screw, nail file, mini-saw bottle top opener,

and much more. Most distribution install programs work like a single knife blade: They become inactive after your first bootup, having served their singular purpose. Performing additional tasks often requires the use of second or third party software. YaST, however, remains an integrated portion of the operating system. If you need to install additional software, modify network settings, or tweak your configuration files, YaST is there to help. This is why I believe that YaST is a cut above the rest. The fact remains that no other installer/configuration tool is more flexible—not even the linuxconf utility provided in other RPM-based distributions.

Keeping up its innovative pace, SuSE recently developed YaST2, a graphical "front end" for YaST. I'll be covering that in detail in the next section, "Navigating with YaST."

For a moment, let me draw you further into the functions of the YaST utility. I will highlight features that will make life a little easier—specifically, the capability to control essential system configurations in an ASCII text-type mode rather than a full-blown GUI environment. This is a reasonable trade-off for those who have a strong UNIX/Linux background who would prefer using the console and text only, and for the new Linux system administrator, who is just getting started.

Table 2.1 groups the most popular distribution install programs and evaluates these based on functionality.

Table 2.1 Installer Utilities Comparison Chart

Distribution	Installer Name	Features
Debian Slink 2.1 (text-based)	dselect interface dpkg/apt utilities	System configuration Package installation Intelligent upgrades, CD-ROM, FTP, NFS, HTTP protocols supported, base network settings.
Caldera (v2.3)	LInuxwiZARD	System configuration, graphical with hardware device installer, autoprobe feature, package installation, CD-ROM, NFS, hard disk installation protocols, base network settings.
Red Hat (v6.1)	Anaconda	System configuration; graphical with hardware device installer; autoprobe feature; package installation; CD-ROM, FTP, NFS, HTTP, and hard disk install; base network settings; Xconfigurator for (X Window system); Update Agent program.

Distribution	Installer Name	Features
SuSE (v6.3)	YaST/YaST2	System configuration; graphical with hardware device installer; autoprobe feature; CD-ROM, FTP, NFS and hard disk installation; base network settings. Integrated features include FTP update tool, multipurpose package management system with automatic post-install system configuration, advanced network utilities, and system configuration file management utility. X Window system utilities include SuSE Advanced X-configurator, xf86config, and much more.

At this point you might feel that I am over-rating this tool, maybe to the point of putting it on my shoulders and carrying it out of the Linux Super Bowl stadium. In close to four years, however, I have not found a version of Linux that has helped me learn the inner workings of the system while also affording me the opportunity to hack and tweak some of the system files. The system tools that were available in the past fell short in function and usability for the less experienced. They have either been all text, or sticky and GUI. This left you searching for the proper command to issue at the CLI, or wading through a bunch of GUI screens to find the proper selection. You'll find it a welcome change to have almost all your configuration tools in one spot with SuSE Linux. The more you use YaST, the more you'll love it.

While the Linux craze rages, most (if not all) of the major distribution companies are seeking a resolution to the daunting task of installing the Linux operating system. SuSE's new YaST2 installer provides a fully graphical install environment with all the latest features. YaST2 is suited for users who do not need custom partitioning or detailed package selection, or those who are short on time and want the automatic installer to run the show. These features also are geared toward a fresh install.



CAUTION

If you are updating your installation, please do not use the YaST2 installer program. It is intended for new installations only.

For those of you who want a tailored install or who might be upgrading or moving from another distribution, YaST1 will be your choice. With YaST1 you will be able to save important files and perform "expert" type installations.

Selecting the Installation Media

Starting the SuSE install begins with a few preparatory steps. The SuSE CD is bootable, if your computer's BIOS will support that function. Most newer machines will have no problem.

If your system lacks that boot capability, you will need to do the following.

1. Using an UNIX/Linux system:
 Be sure to have root or superuser (`su`) privileges. Then insert CD #1, mount the device, and locate the boot image file on the CD. Now insert a blank floppy and use the `dd` command to write the image to the floppy disk. Issue the following command:
   ```
   dd if=/cdrom/disks/eide of=/dev/fd0
   ```



NOTE

For those installing on non-Pentium machines, do not use the "eide" disk image. Use this command for building your bootdisk:

```
# dd if=/cdrom/disks/bootdisk of=/dev/fd0
```

2. Using DOS:
 Make sure that you are in a DOS environment, not using the command.com feature to shell out to an MS-DOS box. Issue the following command after inserting the SuSE CD:
   ```
   D:\setup
   ```
 Follow the instructions, and choose `boot`. Voila! Your boot disk is finished. (Do not create a "root" disk, however, because this version of SuSE does not require it.)
3. Using the rawrite program:
 If you have previous Linux experience, you will be familiar with the rawrite program. This is another feature that enables you to build a boot disk from an image on the CD-ROM from a DOS environment. With the CD inserted, you should find the rawrite program in the \dosutils\rawrite directory. The image files are located in the /suse/images directory. The boot images have the extension .ikr. While in the /dosutils/rawrite directory, issue this command:
   ```
   E:\dosutils\rawrite\rawrite disks\eide
   ```
4. Using SCSI images:
 SCSI images are a bit more complicated. You'll need to create the standard image with this command:
   ```
   E:\dosutils\rawrite\rawrite disks\scsi02
   ```
 Then overwrite the standard image with the kernel image you require.
   ```
   E:\copy suse\images\scsiXX.ikr a:\linux
   ```
 This ensures that all the necessary files are copied to the disk, that the standard image files are written, and that special files are added during the overwrite process.

If you continue to have difficulty making a SCSI boot, refer to `http://sdb.suse.de/sdb/en/html/dipa_6.3_bootdisk.html` for additional information on this subject.

CD Installation

Whether you use the bootable CD or the boot disk option, a cursory reboot will be required. If you immediately strike the Enter key, the familiar `boot:` prompt will appear. If you strike any other key besides Enter, the system will wait for additional input, mount instructions, or boot arguments. Figure 2.1 briefly outlines the installation sequence.

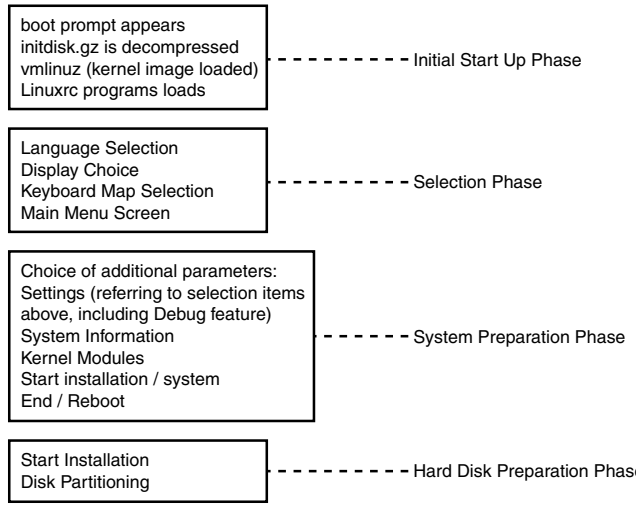


Figure 2.1

Installation step sequence.

Linuxrc is a program designed to load all drivers required for installation. YaST2 utilizes the LinuxrcII program for its auto hardware detection and configuration tasks. SuSE also has come up with a new boot procedure, which is beneficial more in the area of SCSI detection and module loading. The (E)IDE user will see very few changes in the process. The new boot concept is as follows:

- LILO is started by the BIOS (no real difference here).
- LILO, assisted by the BIOS, loads initrd into memory space.
- LILO, assisted by the BIOS, loads kernel (Ramdisk) into memory, passes any necessary parameters, and starts the kernel.
- The kernel initializes and mounts Ramdisk as the root filesystem.

- Required kernel modules are loaded into Ramdisk, commonly SCSI modules. (This is a new feature.)
- The root filesystem is remounted to the physical hard disk, and `init` processes start.

On the user side, the big selections of SCSI kernels (in the Linuxrc/YaST program) no longer exist. Only the basic kernels—i386, Pentium, SMP, APM, and Pentium Optimized—are listed for choice. Changes have been made for the expert user also; for more details, see `http://sdb.suse.de/sdb/en/html/adrian_6.3_boot.html`. The main menu screen of Linuxrc enables you to make some adjustment to your settings. You can modify keyboard and screen settings, and kernel modules offer you the choice of alternate kernel images, depending on hardware used. System information will confirm if all hardware parameters are detected and modules are loaded properly. You can select start Installation/System if you're ready, or End/Reboot if something is missed or forgotten.

As mentioned in Chapter 1, "Assessing the Platform," when you use an (E)IDE or an ATAPI CD-ROM unit, no special drivers are required.

SCSI KERNEL MODULES

Due to the change in the boot process, the selection of SCSI modules has been eliminated. With more than 200 possible kernels images to choose from, the process is now handled by the hardware detection features in Linuxrc.

Network Installation

Network installs can be tricky, to say the least. If you opt to utilize this method, make sure that you or your system administrator is familiar with the technique and has all the pertinent network information required to complete the task.

Directories Required for Network Type Installation

The following directories are *required* to install SuSE Linux. See Figure 2.2.

All the other directories are optional. If you have room available on the hard disk and you want to sample a good variety of Linux software applications, you can copy the complete directory structure.

Installation via Linked Network Interface (NFS)

Businesses are moving away from the "dumb terminal" technology and are refitting with networked PCs. For example, Burlington Coat Factory is switching out the old terminals and upgrading to Linux powered PCs. The principle is to put the maximum amount of resources in the user's control, requiring less mainframe maintenance exposure. You, too, might be in that state of growth or might have a working network with a similar PC environment.

The networked machines on which you're installing SuSE Linux might not be equipped with CD-ROM units. NFS may be your choice of install protocol.

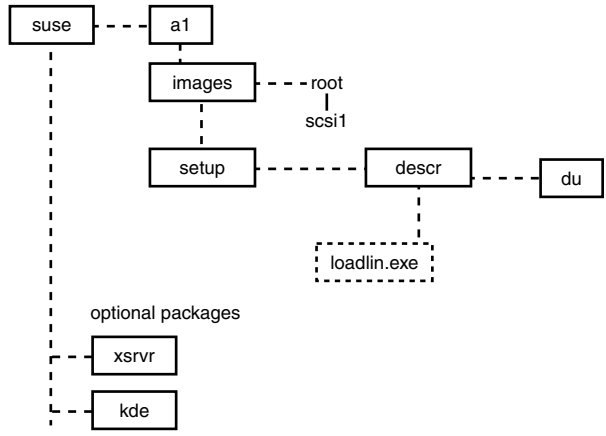


Figure 2.2

Directory requirements.

If the machine has no CD-ROM, it must be equipped with a floppy disk drive. You will have to build a bootdisk using the CD included with this book. You will have to perform this step on another machine that has a CD-ROM drive. Insert the boot disk into the floppy disk drive, and start the computer. Set all your options with Linuxrc and move to the Main menu. Choose Kernel Modules (hardware drivers), and select Load Network Card Module. SuSE Linux will autodetect your card. PCI cards configure almost flawlessly, and ISA cards have all the I/O and IRQ information ready for input. Return to your install, select Network (NFS) as your source media, and set up all the NFS parameters, boot type, IP address, and so forth. Remember to export the complete directory tree; include loadlin.exe if you plan to use it to boot from Windows or DOS.

Another option exists in YaST1 as well: install to an existing directory. See Figure 2.3.

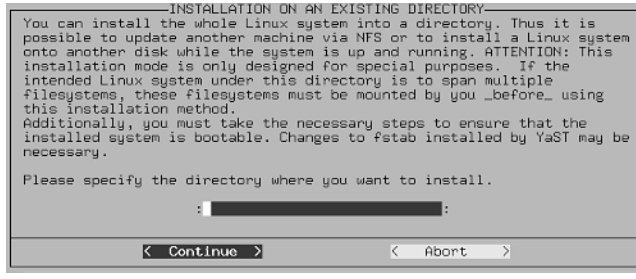


Figure 2.3

Information for existing directory installation.

Network Installation (FTP)

SuSE Linux also can be installed by means of the FTP method. I wouldn't suggest this unless you have a high-speed network connection, such as DSL, ISDN, T1, or cable access, however. Using FTP on a PPP dialup can cause you and your ISP some problems, unless your ISP is really generous. As an example, I received a few warnings about excess connection times from my ISP. It didn't matter to them, even after I told them I was downloading a complete Linux distribution. Then again, I always think that everyone knows about Linux.

This method is similar to the NFS install: Load your kernel modules, continue with the install, and choose Network (FTP) as your source media. You'll need to obtain the address to the FTP server of your choice. The SuSE Linux FTP program uses anonymous user login features and also username protocols.

Copy the required directories (as stated earlier), and begin your local install.

Hard Disk Installations

In the past, Linux support for all hardware was spotty—some components worked, and others did not. The hard disk install was born out of necessity because SCSI drivers were still in the early stages, and some proprietary CD-ROMs were useless. Now, driver support for Linux is linear. As products are made, the support is there.

Your choice for hard disk install may rest on the following factors:

1. You have a large disk with room on it, with a sizable DOS partition to spare, and decide to copy SuSE to it.
2. You have a few machines on which you would like to run Linux, and you have no network connection and no CD-ROM units installed on them. Note: Format disks as DOS partitions.

In this case, you would start by creating the appropriate directories for the base system install using the mkdir command from the C:\ prompt. The directories required are as follows:

```
\dump
\dump\suse
\dump\suse\a1
\dump\suse\images
\dump\suse\setup
```

Be sure to copy initdisk.gz and the correct kernel for your system. Copy those to the \dump\suse\images directory.

Copy the CD-ROM file \suse\setup\inst-img and \suse\setup\ loadlin.exe to \dump\suse\setup.

Copy \suse\setup\descr; if you have enough room, copy \suse\setup\du as well. (This is not required, but it will show you how much disk space is left—a nice little tool if you're short on disk space.)

After copying all the required directories, you can start your install by booting from a bootdisk on the same machine or reinstalling the disk on another machine starting the process. After Linuxrc starts, choose Source Media and then the Hard Disk option. You should find your files in the \dump directory; YaST will help you install from there. If you plan to use additional software applications, these can be added after the base system has been installed.

If you have a number of machines that have the same hardware configuration, this might prove a viable option to NFS or FTP network installations. Relocating a user would be as easy as swapping a disk drive.

Notebook (Laptop) Installation

Computing has moved beyond the stationary PC unit and has gone mobile, bringing a new dimension to high-performance computing.

Think of it: carrying the power of a UNIX network machine in a small notebook-size bag. A few years ago, this seemed amazing. Corporate representatives would come to my workplace lugging these big (and heavy), oversized briefcases containing 80486 processors that ran at 25MHz. These machines would hook up to a telephone line and communicate with the mainframe computer, making changes, modifying files, and correcting errors all from these portable computers. This was cutting edge, I thought. Yet today I have a notebook computer with more computing power than a room full of 1950 punch-card processors.

More amazing than this, my notebook computer runs on SuSE Linux. I have at my fingertips the processing capabilities of a UNIX mainframe-type machine used in big business. If this isn't horsepower, I don't know what is!

Some roadblocks have hindered the progress of Linux on the mobile scene, however. The X Window system was almost impossible to get running because of the lack of cooperation with video chipset manufacturers. PCMCIA drivers also were unavailable and problems with I/O and IRQ configurations.

SuSE Linux 6.3 helps laptop users clear a lot of the old hurdles. With the SuSE Advanced X Configuration Tool (SaX), Xfree86 version 3.3.5, and the Linux v2.2 kernel, laptop installation is easier than ever.

Most newer notebook (laptops) have a CD-ROM installed, or at least have one that is swappable with the floppy disk drive unit. This allows the easy installation of Linux with the CD media. Some older units (and some newer ones) utilize PCMCIA technology to support additional peripherals such as CDs and floppy drives. SuSE Linux supports most PCMCIA devices, although not all. Remember, the mobile Linux scene has a greater distance to travel. This work in progress will only get better with time.

NeoMagic's release of its driver source code has brought about a significant change to the notebook venue. As an example, I wanted to run Linux on a CTX notebook that I owned. The computer was equipped with the NeoMagic 128ZV chipset, and the only driver available cost close to $200. I chose to wait it out. Between that time and now, I have made some changes: I no longer own a CTX, and I no longer have to wait to run Linux on my notebook. I now run SuSE Linux on my notebook. This is like a cliche from a Pacific Bell commercial: new word definition—*Telesis*, which means Progress, intelligently planned.

Notebooks (Laptops) Compatible with Linux

Just as every piece of hardware is not compatible with Linux, the same is true with laptops. There is quite a bit of hope on the horizon, however, and you can find a plethora of information on how to install Linux on a laptop. A few outfits even do this task as a specialty. Table 2.2 lists some name of Linux-compatible portables.

Table 2.2 Linux-Compatible Portables

Manufacturer	Model	Series
Acer	Extensa	355-36x-390 3 series
Acer	Travel Mate	3xx-5xx-7xx ditto
Acernote	Light	350-370 two models
Alcam	Designer	i400
AMS	Roadster	15CTA
AMS	TravelEx/TravelPro	105/256CXA 2models
Apex		XC-200
AST		J30
AST		M1560X
AST	Ascentia	A/P55/810/910N 3mods
Best		1100/6650CD 2 series
Broadax		6650
Chembook		3000/6000/7000/9000 series
Compaq	Armada	1100-7790DMT range
Compaq	Armada	M700
Compaq	Presario	1000-1925 range
CTX	EasyBook	700/800 series
CTX		V92C266
Dell	Inspiron	3000-7500 range
Dell	Latitude	CP M233XT-CpiD300XT
DynaNote		500
Fujitsu	Lifebook	555T-E350 2mods
Fujitsu	LiteLine	C400DVD
Gateway	2000	2000-9150 range
Hitachi	Visionbook	Plus/5000-7500 range
HP	Omnibook	600-7100 models
IBM	Thinkpad	350-i721 2mods

Manufacturer	Model	Series
Jetta	Jetbook	850-7080 2mods
Micron	GoBook/GoBook2	
Micron	Millennia Transport	
Micron	Transport	TREK2
NEC	Ready/Versa/VersaLX	120LT/6200MMX 2 mods
OKI	OkiBook	D266
Olivetti	Echos	
Panasonic	Toughbook	
Samsung		GT400VX/SENS810 2mods
Sharp	Actius	A100
Sharp	Mebius	5600
Sharp	PC	8650II-9020 2mods
Sony	Vaio	PCG-C2GPS-PCG707C-838 3mods
T.I.	Extensa	300-655CDT range
Toshiba	Libretto	
Toshiba	Portege	3010-7020 range
Toshiba	Satellite	1100CS-4090XCDT range
Toshiba	Tecra	500CDT-710CDT range
Umax	Actionbook	318T-530T 2mods
Winbook		FX-XP5
@Book		900C

Recommendations

These are just a few of the potential mobile platforms available. Don't be disheartened if your particular machine is not listed; my Compaq Presario 1270 was not listed in any of the supported documentation I read. My general philosophy is this, "If I can get it to start, I can tune it from there!"

I had very little problem installing SuSE Linux—my hardware was detected, and the pesky multifunction PCMCIA card configured almost perfectly. (I will cover some SuSE-specific PCMCIA troubleshooting problems in Chapter 5, "Booting into SuSE Linux 6.3 for the First Time.")

I would recommend that you get all the system information on the mobile unit in question. Then brush up by going to the URL `http://www.cs.utexas.edu/users/kharker/linux-laptop/`.

If you run into problems in the midst of the install, you can access the laptop HOWTOs at `http://www.linuxdoc.org/HOWTO/Laptop-HOWTO.html`.

The modem that is installed in your notebook might work well with Windows, but when it comes time, you might find that using Linux to connect to the Net is a lost cause. Try the Web site `http://www.o2.net/~gromitkc/winmodem.html` for the reason and the solution(s). You also can find information on the Lucent Type Winmodem Driver at `http://www.suse.cz.development/ltmodem/`.



WARNING

This modem driver is not guaranteed to work. The driver is in beta development only.

Summary

As with any distribution, there are some documented problems. You might find it profitable to look into some of these problems prior to starting your installation. Point your Web browser to `http://sdb/suse.de/sdb/en/html/bugs63.html`.

This chapter was designed to help you choose the best method of installation. The SuSE Linux CD-ROM that is included with this book will be the easiest method available. If the need arises, you can install SuSE Linux via NFS or FTP (network type methods), or you even can copy it to a DOS hard disk partition and install it. Your careful planning and assessment of your installation will be worth the time invested.

CHAPTER 3

Hard Disk Partitioning

The partitioning process is *the* most important part of a successful installation. Partitioning dictates how you will allocate user space, how much software can (or cannot) be installed, and how much you can grow without making any changes to your disk structure.

I subscribe to a few mailing lists, and questions always arise when someone asks, "How do I partition my disk(s) for maximum efficiency?" You'll get a least three or four different answers because you might partition your disk one way and the guy in another shop might have a whole different method.

Effective partitioning comes down to this: *experience*. No one way works the best. The key is to meet the need of your specific environment. This chapter is designed to help you build a solid installation and work out some of the bugs in space allocation. I'll take for granted the fact you've partitioned disks in the past, moving past the basics to show some of the advanced principles behind effective partitioning.

Linux currently utilizes two filesystems. The EXT2 filesystem is capable of handling high-throughput data transfer, supports long filenames, and has built-in error checking and tolerance features. This filesystem also allows permissions settings, which give the system administrator control over who uses what. Second is swap, a filesystem in which data is transferred from memory space to disk space, which is specially allocated and uses filesystem type 82. The native Linux filesystem, type 83, is distinguished by the kernel and increases system efficiency by clearing the swap data without sorting through the standard data code. This feature in itself has enabled Linux to move beyond the average operating systems.

The current Linux explosion has generated the need for quick and effective partitioning—the emphasis is on quick! SuSE Linux offers two different methods by which to partition your hard disk. The key will be your specific environment, that is, software applications, workload, and number of users.

Partition Planning

Having a plan on how much disk space is to be allocated to certain applications is the best way to start your installation. Using automatic installation programs sometimes limit your tailoring capabilities. Looking at this from a planning aspect, you'll see that this might not suit your purpose. Figure 3.1 shows an example of erasing and creating partitions with the YaST2 installer.

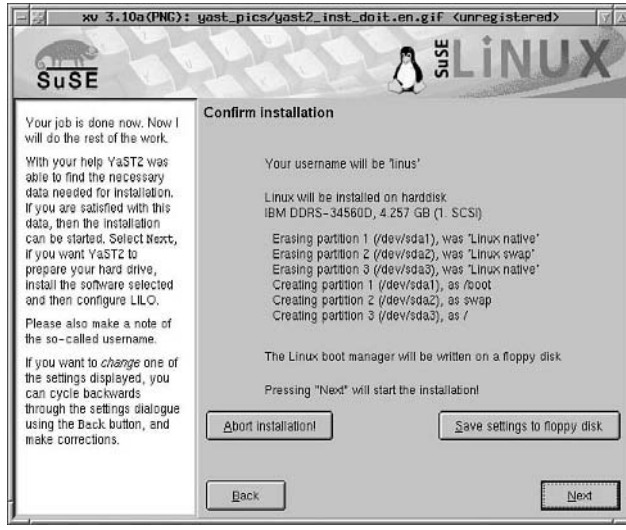


Figure 3.1

Partitioning with YaST2.

The resulting partition structure leaves quite a bit to be desired. Using /boot, swap, and / does not give consideration to the possibility of a damaged or corrupted filesystem recovery. The partition / contains /usr, /usr/local, /home, and /var. In the event that a damaged file cannot be repaired and you have no existing backup, the partition might have to be destroyed and rebuilt. There went all your users directories (/home) and system logs and information (/var)—that's a sobering thought, isn't it?

CAUTION

The nature of automatic installations is that the user interactions are limited, which could lead to potential problems. I am not against auto install, but I would hope that as Linux matures, so do these type of programs.

Single Disk Partitioning

The fact that disk space allocation is not set in stone does not preclude you from making wise choices. Take a look at the following partitioning outline to perhaps escape the awful scenario that would occur if you said to your CTO or IT Manager, "Boss, we have a slight problem …."

If you span the filesystems (partitions) over a broader area, this will provide a simple solution. Setting up a separate /, /usr, /var, and /home filesystems will enable you to save critical data, such as system log files, user directories, and software applications. Figure 3.2 shows how this can be done.

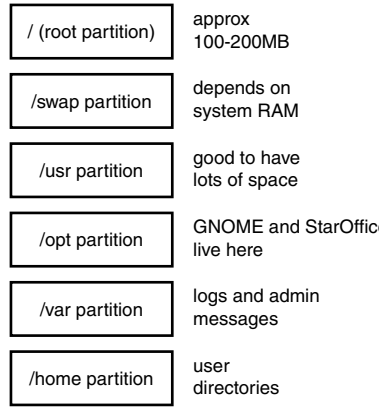


Figure 3.2

Single disk partitioning scheme.

TIP

This partitioning technique has saved me more than once. One of the Linux boxes that I ran had a partition (filesystem) dedicated to downloaded software. Most of it was for the GNOME 0.9/Enlightenment 0.14 release software. There was a large amount of broken dependency issues (as you might remember), which required numerous packages to get everything running. I saved all the .rpm packages in one directory so that if something went wrong or I decided do a quick reinstall, I would be able to use the existing partitions setup, only I would not format the partition that contained the software packages. When indicating the new mount points, I would restore the original partition name and I was back in business. That's where taking a little more time pays off.

Using the single-drive, multipartition scheme seems to be successful for most standalone and networked PCs. This kind of setup also works on laptops that have either a fresh drive or a lot of unused space. Out of 4.3GB, I use 2.5GB for Linux. Take a look

at the Partitioning HOWTO at `http://www.linuxdoc.org/HOWTO/mini/Partition.html` for more information.

Multidisk Partitioning

With Linux running on increasingly more servers, the big question is how much is enough. Perhaps your application does not merit a RAID-1 system, requiring the ultimate in mirroring and fault tolerance. Multiple disks could be your solution because the ability to spread out your resources and protect them from damage or corruption is paramount. SuSE Linux configures multiple disks with no problem. Figure 3.3 illustrates a very simple multidisk setup.

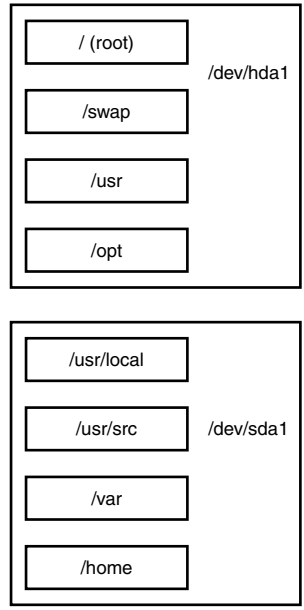


Figure 3.3

Multiple hard disk partitioning scheme.

Notice how /home and /var are on a different disk. I also included /opt on the secondary disk. This filesystem can serve as a place to keep your database information and other things such as StarOffice. You might want to examine the setup and construct the best layout for your needs; for instance, it is effective for businesses on a tight budget that have no use for RAID arrays.

For more information on how to partition your multidisk space, point your browser to `http://www2.double-barrel.be/linux_web/LDP/HOWTO/Multi-Disk-HOWTO.html`.

Mission Critical Disk Partitioning

In the future, companies and large corporations likely will decide to utilize Linux as a server solution. With this in mind, kernel developers have integrated advanced features into the generic v2.2 package. Most of the improvement have been tested and used in UNIX systems for a while, so the growth of Linux has somewhat overrun its maturity. The object now is to implement the existing applications into the current kernel versions.

Staying on the bleeding edge of technology, SuSE has incorporated some additional filesystem features besides RAID support, which is standard in all v2.2 kernels. With the Linux platform reaching enterprise levels, there has been a swell of requests that support a faster, more flexible filesystem and new ways to control disk space in big business environments. SuSE Linux has added into the 6.3 version two filesystem management programs which are in the developmental stages. The first is ReiserFS, and the second is the Logical Volume Manager (LVM) program. ReiserFS is maturing at a rapid pace, and LVM support is being built into the v2.3 development kernel, which indicates that it may be a part of the upcoming 2.4 kernel release. So each of this will provide big businesses increased efficiency.

Raid Arrays

RAID (short for Redundant Array of Inexpensive Disks) ensures that information storage is consistent by spreading it across several disks, using techniques such as RAID Level 0 (disk striping). This method provides no mirroring benefits (in case of a disk crash), but it does decrease disk latency time, which speeds up data transfer rates.

RAID level 1 (disk mirroring) helps achieve redundancy and recoverability from hard-disk crashes.

RAID and disk setup fall beyond the scope of this discussion. You can find more information at `http://metalab.unc.edu/pub/Linux/ALPHA/linux-ha/High-Availability-HOWTO.html`, `http://www.vogon-international.com`.

There are also resources that will help with specific types of RAID application. Software RAID and hardware RAID HOWTOs are located at `http://www.linux.org.il/LDP/HOWTO/mini/Software-RAID.html` and, for SCSI applications using the DPT Smartcache controllers, at `http://www.linuxhg.com/HOWTO/mini/DPT-Hardware-RAID-1.html`.

Reiserfs

The Reiserfs filesystem has journaling capabilities (reducing startup time due to disk integrity checks performed by the *e2fsck* program after an unexpected shutdown), features resizing, and uses a balanced tree algorithm to minimize the average number of disk accesses. There have been some significant successes in the development of reiserfs, especially the journaling aspect. See the press release at `http://devlinux.com/projects/reiserfs`.

SuSE's High Availability Support Group is closely involved with current development. If you see this as an option, you can get more in-depth details at `http://devlinux.com/projects/reiserfs/`.

Logical Volume Manager

The Logical Volume Manager (LVM) is available as an option while partitioning your disk. This tool has been around for a while in the computing world—users with a background in UNIX especially will recognize this utility—but SuSE has elected to break new ground and offer it in this version. To use the LVM system you will need to have some knowledge of how the LVM structures the disks. If not, it's better to use a conventional partition scheme.

For more detailed information, check out `http://linux.msede.com/lvm/#introduction`.

Take time to study the details: This is something you may want to evaluate more closely because there is a lot of potential in this area of storage management.

Swap Space—How Much Is Enough?

I once read an analogy that went something like this: "Swap space is like a heated toilet seat. There is not a great demand for it, but it comes in handy when you need it." The v2.2.13 kernel does not impose the 127MB swap partition limitations as the previous v2.0 kernels did, so the sky's the limit. Before you delegate too much space for swap, however, consider these factors: I have run up to 256MB of swap with no perceivable performance increases. For performance, you can locate your swap space on different disk(s). If one disk has faster seek times specs and a larger cache, use that for swap. Also use the swap space standard 64MB RAM = 128MB swap. Unless you're running a fully loaded server or a super-intensive CAD with constant 3D rendering, you'll do fine.

Partitioning Your Disk

The SuSE partitioning tool is based on the old faithful Linux utility fdisk. The YaST1 interface makes the job pleasant and very straight forward.

SuSE's YaST1 and YaST2 have separate partitioning utilities. As stated in Chapter 2, "Installing SuSE Linux," YaST2 has been designed as a transitional tool, suitable for users who are *not* interested in custom installation or in a hurry to get their system up and running.

YaST2

SuSE's new installer, YaST2 attempts to ease first time installations by setting up most of the usual post-installation parameters like root username, root password, and also mouse settings to name a few. With this occurring at the beginning of the install, the only thing that's left is the network setup after the system has been installed. I'll skip the setup screens and move to the YaST2 disk partitioning utility. Figure 3.4 shows the YaST2 partitioning selection screen.

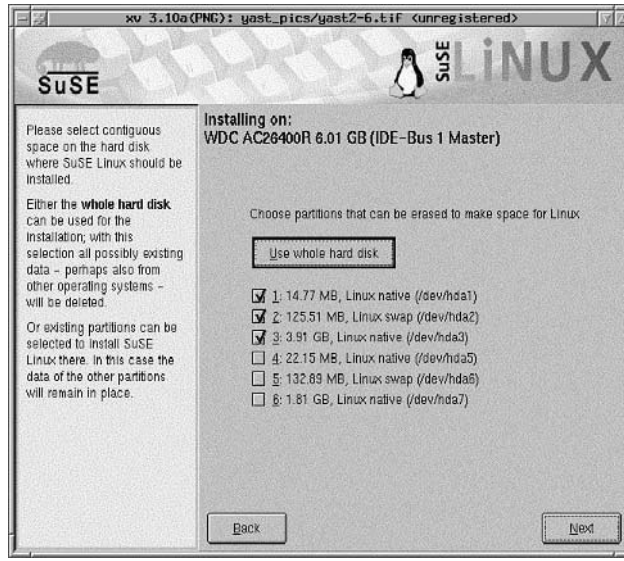


Figure 3.4

Selecting partitions for installation with YaST2.

You will be given the option either to delete existing partitions to make room for Linux, or to dedicate the whole disk to your SuSE install. The YaST2 utility is new, so unfortunately it does not offer a lot of flexibility. Those desiring a quick install can request that YaST2 perform all partitioning (automatically). This might not be optimum, but it'll get you going. Figure 3.5 shows an example of the final partitioning setup display before installation. Note: the field that reads "tux" will contain the name you input during initial setup.

WARNING

YaST2 has a problem recognizing large disks of more than 8.4GB. If you have a large disk, you might have to partition it with YaST1. YaST2 will indicate whether there is a problem with disk detection. For instance, I was unable to partition my 17.2GB Seagate hard disk.

YaST2 then will move to the next step, which is to delete the requested partitions and rebuild the filesystem(s).

The YaST1 Partitioning Utility

You've decided to custom partition your disk with YaST1. With your disk storage plan worked out, it is time to move ahead. I'll take you through the final phases of preparation and give you some last-minute tips.

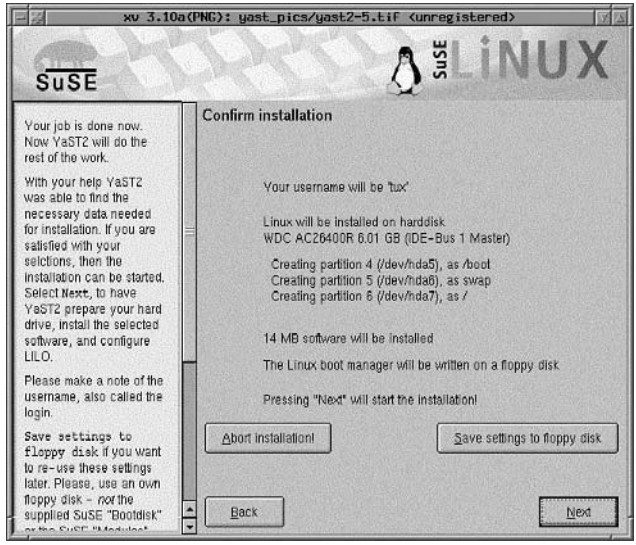


Figure 3.5

YaST2 confirming partition setup.

SuSE Linux will give you the opportunity to select which disk (if there's more than one) to partition. The fdisk utility will detect disk size and partition type. See Figure 3.6.

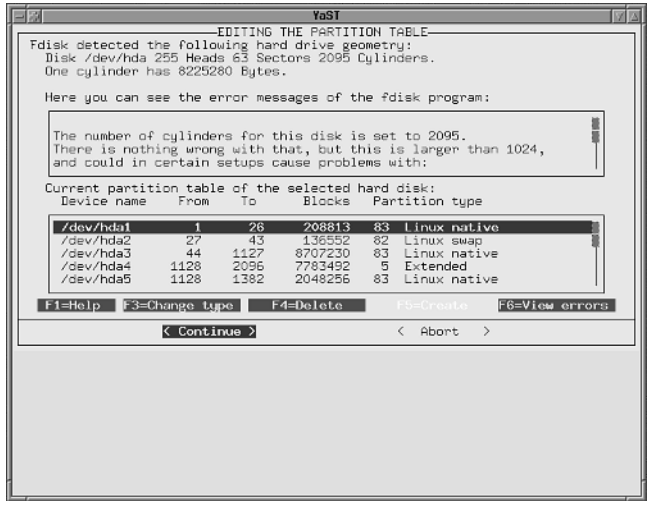


Figure 3.6

YaST fdisk interface utility.

The fdisk utility supports various types of partition formats. The ones shown are type 83, which is Linux native (ext2), type 82, Linux swap and type 5, which is an extended partition. Extended partitions, or as SuSE calls them logical partitions, are used quite often, since the fdisk utility can allocate only 4 primary partitions. If you have a large disk, there's a good chance you will create a sizable extended partition.

As you allocate space on the disk, keep in mind the software applications that you'll need to load and possibly some database space or user space for home directories. Note the prompts at the bottom of the menu. Using the function keys will give you access to system help (F1), specify filesystem type (F3), delete (F4), or create new partitions(F5). The F6 key gives you full access (not just the header) to errors found by the fdisk program.



TIP

SuSE's fdisk program has a memory, which comes in handy if you make a mistake or hit a key that aborts the procedure. When you restart fdisk, the changes that you made prior still will be there. Most fdisk programs will return to square one if you use Ctrl+C to abort the operation.

Format Selections

This is the last step prior to the software install. The Linux filesystem is tied together and forms a tree, with root (/)as the central point. All the other filesystems—/usr, usr/local, sbin, and /etc—are branches leading to /. Examine the setup in Figure 3.7, and note the "no" in the format column.

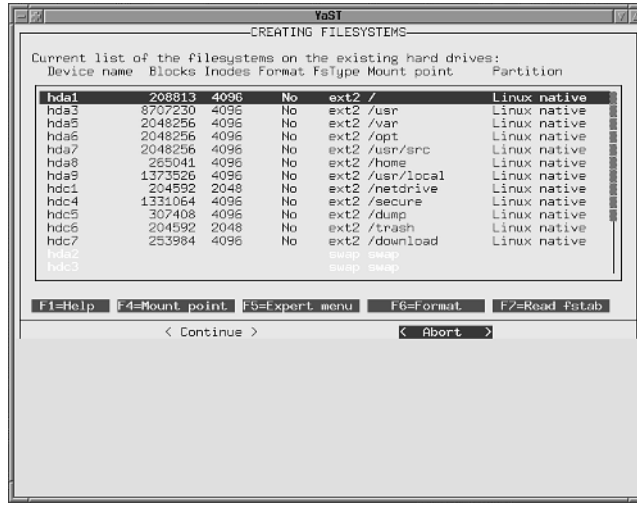


Figure 3.7

YaST fdisk utility for creating/modifying filesystems.

Here you can indicate your mount points by name—the prompts at the bottom of the menu will help you. In this case, Help (F1), Mount Point (F4), and Format (F6) should be your only concerns.

The program defaults to "no" on formatting so that during an upgrade, the system will not automatically delete the data on an exiting partition.

WARNING

Remember LILO's 1024 cylinder limit. When making mount points, the system allows you to make several different choices. No matter which way you partition, if the kernel (vmlinuz, System.map, and so on) information resides above the 1024 cylinder, LILO will hang up. When you reboot, the boot prompt comes up and reads LI, which means there's a good chance that /boot is out of bounds.

Summary

Now you're ready to install the system on the freshly prepared disk(s). Before you do, I'll run a quick recap.

You've decided on the applications required and the proposed use of your SuSE Linux box. Using either YaST1 or YaST2, you've set up your swap space and mounted the filesystems. Then you're all set!

CHAPTER 4

SuSE Software Package Installation

For years, reading items on a few mailing lists and reading software reviews kept me from using SuSE Linux. Hearing that YaST was confusing and had presented quite a few installation problems did nothing to boost my confidence. To make matters worse, I had heard of booting problems, X server configuration troubles, and others things that go bump in the night.

Although I was able to install other Linux distributions with no problem (Debian, Slackware, and even FreeBSD), I refused to try SuSE because of the hearsay reports. Well, it's time to clear up all the hype and get down to facts. Yes, YaST *had* its share of problems, just like any work in progress. Those problems that existed back then *may* still exist now. How's that, you say? The problems still may arise if the users don't understand how the installation process works. The better acquainted you are with the capability of the YaST program, the more you will use it.

It's a well-known fact that an effective, clean install will take some time—time well spent, I might add. YaST provides this type of environment. More importantly, SuSE has improved its position in the graphical install arena by providing YaST2. This installer is a good one to use if the user is somewhat new to Linux or, as stated in Chapter 3, "Hard Disk Partitioning," if speed is of the essence.

I have had an opportunity to read some of the product reviews concerning the 6.3 release. Through no fault of the reviewers, taking a quick run-through of the install will in no way make evident all the components in YaST. I believe that software reviewers have missed significant tools and features that are

integrated, in the interest of the quick installation solution. I hope to clear up some of the misperceptions that have cropped up and to dispel the hype about SuSE's most effective tool, YaST.

YaST is designed to extend the flexibility of the software package manager—it plays the "middleman" in most processes and is a front-end user interface that automatically converts the CLI command to a selection-type menu. Installing and removing software therefore becomes a breeze.

Another cool feature in YaST is that it enables manual package dependency checking. This eliminates the task of going through the package selection and waiting for the install program to complain or accept your choices. I'll show you other features as well that will make the package management more consistent.

YaST Package Handling Methodology

SuSE Linux utilizes the Red Hat Package Management (RPM) system, which is used in the majority of current Linux distributions. The difference in the SuSE distribution is YaST's interaction with the package manager. Why is this so important? Let's look at the big picture.

In the past, installation of non-RPM packages required several steps, such as, `./configure`, `./make`, and `./make install`. Other packages required identifying the target system with the command `./make linux` or by using perl scripts, with `./perl config`. Without examining the README file, you could possibly find yourself giving up and failing to install the software. This is no excuse for laxity, though, and I am not one to always use .rpm-type software. The point is that because of the various methods and mechanisms of installation, using a common install protocol is expedient. SuSE Linux includes a tool for unpacking .tar.gz and .gz files also. I'll cover its functions later in this chapter.

With Linux moving into the mainstream of computing, first-time installations and subsequent software package additions are inevitable. Finding an industry standard for package management helps newcomers and old hacks alike.

It's a known fact that package management differs in a few cases, such as with Debian Linux, whose package manager is called dpkg, and whose user interfaces are dselect and apt. Likewise, Stampede Linux utilizes .slp packages, and Slackware uses pgktool to handle the .tgz-compressed file installation.

On the other hand, Caldera, Red Hat, Turbo Linux, Mandrake, SuSE, and quite a few others use RPMs. Does this make RPMs better than the others? No, but it does give you the ability to use some of same software used by one distribution on another. Thus, if multiple distributions use the same package-management system, the chances of finding an elusive software application decreases. People who maintain the system will be more confident in using a similar package management system.

RPMS AND SECURITY

RPMs are convenient to use, but you should be aware of some concerns. You must install RPMs as root (or superuser) to have the necessary write permissions. This poses a threat to system security. Some people might not consider it as such, however, or might regard this as trivial. Here are the facts, though:

The RPM installer operating on the root account now has full read-write access to your system. This opens a potentially hazardous security hole, and you may unknowingly zap some system binaries and libraries, rendering some other applications useless. In addition, in the worst case, you might install a Trojan horse program that could compromise the integrity of your system.

For this reason, MD5 checksum capabilities have been included in the package manager. I'll show you how to verify the packages in the Changing/Creating Configuration section of this chapter. Where you get your software is highly important—see Chapter 13, "Securing the Network." The life of your system depends on it.

To assist in the smooth installation of packages, interfaces such as gnoRPM and xrpm have been designed. Still, no matter how fancy these tools are, they are overshadowed by YaST. For a tool to be effective, you must *want* to use it. YaST has helped with the task of partitioning and formatting the disk, and it stands ready to guide you through the task of package selection and disk use management (a feature that by itself is worth its weight in gold).

With any computer system, software management is a critical area. Large or small systems can ill afford the chance of incorrectly installed or improperly configured software. Granted, nothing is foolproof, but lessening the odds of failed application is the goal of every serious developer. Using RPMs makes the job of installing software more livable.

For those of you who have not used RPMs recently, the package manager has had some upgrades applied to it. The current version is 3.0.3. The features included in the 3.0 version consist of multiple package installation, which reduces the chance of unverified package dependency failures, and the ability to check for the proper amount of disk prior to installation.

Other enhancements have been built into the package manager as well. Detailed information is available at `http://www.rpm.org/`.

However, there are two implementations of YaST in this distribution. YaST1 handles the basic (hard-core) tasks. Installing the system with the original YaST may prove to be educational, so again familiarity is the essential element.

The age-old problem during first-time installation is knowing what package(s) to select and what is really necessary. This might seem to be an issue reserved for those who are becoming acquainted with the fundamentals of Linux installations, yet I continue to hear questions raised and issues brought up on mailing lists as to the selection of packages—and no really specific answers are ever given. The main reason for these

questions is that software inhabits hard disk space. When using GNU/Linux software, users are faced with an immense selection of additional applications. I am sure that this is why some people have a problem with delegating adequate space and living within those boundaries. Those in the computing industry have used proprietary software most of their lives, so Linux presents some welcome choices. Still, when you've lived in thin air for a while, your body becomes accustomed to deficiencies—coming down to sea level can make you tipsy!

Before you fire up the installer, get a good idea of the application that you will need to use on a daily basis. Make sure that you account for your graphics, word processing, and any other application that will be used daily. This is not to limit you in any way; in the past, however, I have wasted a lot of hard disk space because I wanted "everything" on the disk. In the long run, I found that some applications that were not daily necessities became dead weight.

If you are building a test machine or an R/D platform, or if you have a huge amount of disk space available, this may not be applicable to your setup. If you have limited hard disk space or use a laptop, however, this advice is for you.

Installing Your System with YaST2

During the installation phase, you may have chosen YaST2 as your installation utility. If so, you can specify an automatic or guided install. As the name suggests, an automatic installation minimizes user interactions. You might want to select a guided installation, however, to give you a feel for what the YaST2 program is doing. Figure 4.1 illustrates the YaST2 installation menu.

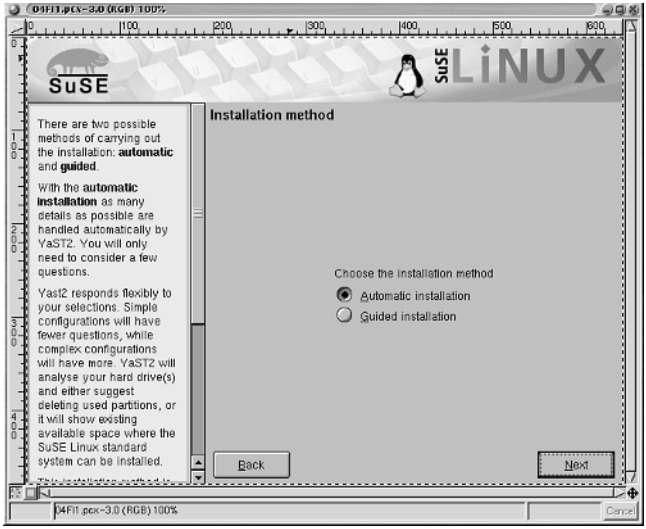


Figure 4.1

Selecting the YaST2 Automatic Installation feature.

With its recent development, YaST2 will indeed improve with time and testing because SuSE has been responsive to input from those who use its software. In Figure 4.2 illustrates the YaST2 software selection menu.

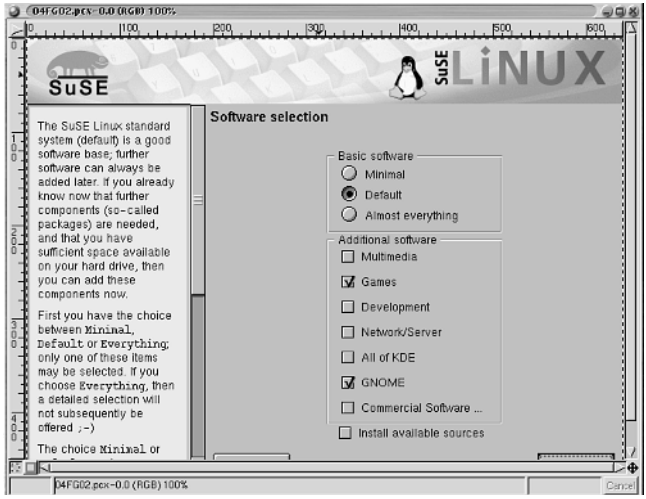


Figure 4.2

Selecting software applications with YaST2.

If you choose Minimal or Default (standard), you will have an opportunity to choose the packages installed. The Almost Everything selection is not a wise choice, however, because it installs software applications that you'll never use or need. The only case in which I would recommend this type of installation would be if your machine has a good-sized hard drive and its primary purpose is for R/D or testing.

Choosing your package is a straightforward operation; YaST2 will do the rest. If your choice of software exceeds the amount of space that has been allocated to Linux, YaST2 will warn you. At that time, you can adjust the number of packages installed and then continue the installation.

Installing Your System with YaST1

For fine-grained installations, you will need the YaST1 utility, which is equipped with an arsenal of utilities to ease the task of installing a system. You'll have the ability to load, change, and save a specific installation configuration. A unique feature also allows you to browse the complete range of software and gives you the ability to search the entire package menu. I strongly urge you to get familiar with all the options in this installer.

YaST1 provides a wealth of features during your install and includes a number of menu selections, each one of which you should get familiar with. The one thing that amazes me the most is that so many people are hurrying to get their system(s) installed that they miss some of the finer points of YaST1—that's like buying a luxury ocean

liner and staying in your cabin all the time. Getting the most bang for your buck means taking a tour of the ship. The same principle is involved here: If you want to view snapshots or look at a short film clip about the ship, stick with YaST2, but if you really need the most from SuSE Linux, YaST1 will be your experienced tour guide.

YaST1 Package Selector

The YaST1 package selector is relatively easy to use. YaST1 offers multiple choices during the initial install phases. Figure 4.3 shows the choices.

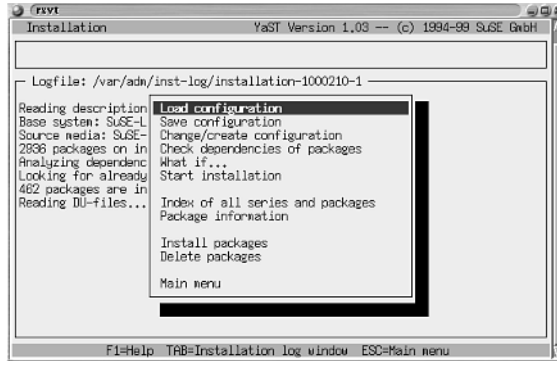


Figure 4.3

The YaST1 Main Package Installation screen.

Each of these selections is important. This list summarizes the specific functions:

- **Load Configuration**—The program presents a list of predefined packages that range from Minimum System to Almost Everything. This selection enables you to utilize a saved system configuration.
- **Save Configuration**—This selection saves the current system configuration to disk or to a directory of your choice. Using the saved configuration when YaST1 requests Load Configuration mirrors your last installation. This can help in cloning applications on several different machines or performing rollouts on networks.
- **Change/Create Configuration**—This option enables you to change a predefined or saved configuration by listing packages in categories called series. Each category contains a listing of components ready for installation, deletion, and so on.
- **What If…**—This selection gives you a look at your present configuration before starting your installation. This option can be useful when you are updating your system and want to confirm that all the correct packages have been marked for installation, not deletion.
- **Start Installation**—This is it! This selection starts the SuSE Linux install program. Important note: If you updated your partition, the program will give you

a prompt to reboot. This verifies the partition table, and you should be set to go.

- **Checking Package Dependencies**—This feature gives you the option to check package dependency at any time during the installation. If you're selecting quite a few packages per category, I recommend checking dependencies after every category. The program has an Auto feature as well, which also attempts to resolve any package dependency problems. If this does not clear up the problem, you will be directed to the file(s) with the indicator AND (all list packages should be installed), OR (if you have chosen a package, one or more of the listed package should be included), or EXCL (none of the packages listed require installation).
- **Index of All Series and Packages**—This selection finds you a list of all the packages provided on the distribution. If this is an update, it will mark all the packages that are installed on your system with an asterisk (*). It also will list the package, version number, file size, and the series group it is listed under.
- **Package Information**—This is a very useful option because it enables you to search through the CD and the hard disk directory structure for a specific package. It is also case-sensitive, allowing for a more defined search. If you are unsure of the exact name of the package, you can search for specific strings of text and output all the applicable files.
- **Install Packages**—This is useful when you have to update files from an ftp server (`ftp.suse.com/pub/suse/i386/update/6.3` is the server URL listed the configuration file), or if you have downloaded files to a directory on your hard disk for installation. You also can mount a CD (other than the distribution) and install software from it. The YaST1 installer recognizes the following file formats: .rpm, .spm, .src.rpm, and special .pat patch files, which are available via the SuSE ftp server. It also supports compressed tar files, in .tar.gz and .tgz file formats.
- **Deleting Packages**—The final option selection provides you with a package listing of all the software currently installed on the system. I found this utility unique because it lists SuSE type software and lists packages that are not installed by the distribution. Please note that the installer will recognize the programs and delete them; they will not be found on the list for updating or dependency checking. If you have installed a foreign program, it would be best, if possible, to replace that package with a SuSE-built package.

All these elements play an important role in managing your software applications. Take a good look at the entire range of options because this is a prerequisite for any serious installation. YaST and its companion tool sets are well worth getting to know intimately.

Choosing/Installing Packages

SuSE Linux has always been a leader in package availability. The CD that accompanies this book contains a significant number of software packages. When you are ready to start installing the software, choose the Load Configuration option. You may quickly select a prebuilt package from those illustrated in Table 4.1.

Table 4.1 Prebuilt Configurations

Choice	Description
SuSE Almost Everything	Almost all the package on the CD will be installed
SuSE Development system	Development environment with programming tools
SuSE DMZ base system	Hostile environment configuration, only the essential installed
SuSE Games	SuSE system complete with all the games installed
SuSE Gnome system	GNOME project environment with the Enlightenment Window Manager
SuSE KDE system	KDE Project environment with the KDE Window Manager and accessories
SuSE Minimum system	Minimum system Environment contains limited software applications
SuSE Multimedia system	System contain all the necessary software for recording, modifying and mixing audio applications
SuSE Network Oriented system	System Designed for network duties
SuSE Office Server	Contains softwar for server interactivity, Samba, NFS, YP(NIS) and other applications which will allow the integration of SuSE into a multi-platform environment
SuSE Default system	Offers good balance of tools and application that are useful for daily tasks

NOTE

SuSE Linux offers a small Help section that can be accessed by striking the **F1** key. By design, this section assists you with loading previous configurations, making an info disk (for those of you who are updating and want to retain your present settings). It also gives you information on building a boot disk for your system.

This menu enables you to choose a number of different system configurations. This is where you will have to really narrow the focus of the machine's use. If you decide to load everything but the kitchen sink, use the SuSE Almost Everything selection. If the box is used in a network environment and traffic is heavy, with possibilities of outside intrusion, select the SuSE DMZ (De-militarized Zone) base system, and add other components as necessary. If you are unsure whether the configuration will meet your needs, press the **F2** key to display the package (description) contents for your examination. You can scroll through the packages to assess them and note whether you need more or fewer applications.

The prebuilt packages can be selected for server duties and standalone workstations. The beauty of the whole system is that you have sort of a basic structure to work with, and making additions is easier than filling you drive full and regretting it later.

Selecting a package like the SuSE GNOME system, you will see that multiple options are checked off automatically because the install program is resolving any dependency problems at the outset. (See Figure 4.4.)

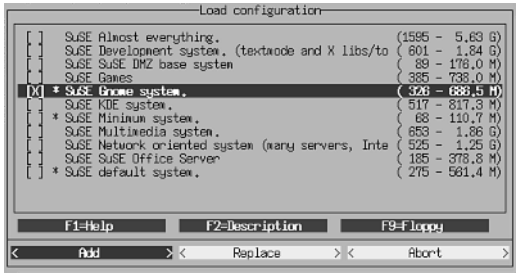


Figure 4.4

Loading pre-built SuSE packages.

After defining the base configuration, the program calculates the available disk space and either moves to the Series screen or halts and warns you of low disk space. The warning is specific and will tell you which partition(s) are affected. If your choices are written in stone(as with a preconfigured installation), then your only choice may be to restart the installation and adjust the hard disk partitions to make room for the required software.

Not wanting to box you in with a lack of options, SuSE provides a Replace option for present configuration and an Abort feature, just in case you change your mind.

The Series menu is comprised of a few different elements, including the selection menu, help screens, a restoring feature, a dependency check utility, and the Exit function. This screen also contains a real-time disk space utility that shows your disk space at the bottom of the screen. For those who have multiple disks or large disk that contain numerous partitions, select Zoom (**F3**) to display the complete disk structure (see Figure 4.5).

You can monitor you disk space when adding or removing applications with the disk space utility. This is a lifesaver when space is a premium.

The additional Help screen assists you in understanding package selection and dependency checks. The Help topic explanations are straightforward and easy to understand.

The restoring feature allows restoration of packages and complete series, as required. Those who have a limited experience with SuSE will look past these tools and sell themselves short—take full advantage of each of these tools. They will make installation a snap.

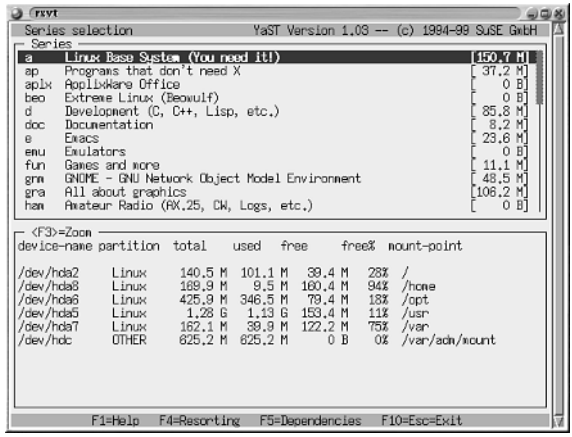


Figure 4.5

Viewing SuSE software series selection.

Updating Your System

Somewhere down the line, most computer users have performed some type of update to the system. The fact of life is that software, no mater how good, always gets better. To prepare for the inevitable is a good thing. If you are updating a previous version of SuSE Linux, I suggest that you copy your configuration files (/etc and /var) and get ready for any unseen catastrophe that may occur. (I'm not saying that it will, but be on the safe side.)

You must use the boot disk or adjust your BIOS so that it will boot from the CD-ROM. When Linuxrc starts up, choose Update Existing System; YaST1 then will take over.

1. YaST1 presents an option for the root partition selection. Choose the root device by reading the current /etc/fstab file.
2. YaST1 then updates the configuration files and produces a backup copy of all the changed files.
3. An Update menu will give you an opportunity to update the base system files of your choice.
4. With YaST1 and the RPM package manager, checking the old configuration is as easy as locating the file /var/adm/inst-log/installation<.rpmorig or .rpmsave>.

If you decide to do a full system update, YaST1 will scan the existing database and give you two lists, one of installed packages and another of recommended updates.

The Update screen is shown in Figure 4.6.

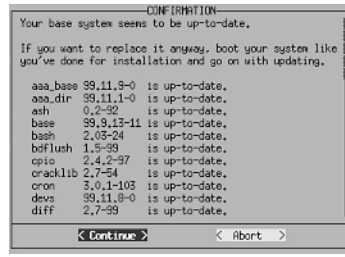


Figure 4.6

Yast1 checks for software updates.

The figure shows a system that is up to date. If the system had required an update, the package information would have been displayed. If you update versions, you'll completely overhaul the system—in this case, the procedure is like an initial installation, choosing a new kernel and the rest of the setup routine. If you experience problems and decide to bypass the setup routine, simply type this at the boot prompt:

```
boot:NO_AUTO_SETUP=true
```

By doing this, the Autosetup feature will be disabled.

If you encounter problems in updating your SuSE Linux distribution, refer to `http://sdb.suse.de/sdb/en/html/adrian_6.3_update.html` or `http://sdb.suse.de/sdb/en/html/bugs63.html`.

Package Information

Each software package provides a brief description during installation for evaluation purposes. If you are not sure whether you want to install a specific application, you can mount the CD with YaST1 and call up the Package Information option. This will give you detailed information on the specific package in question. Figure 4.7 shows a new package selected.



WARNING

If you are querying the CD for package information, insert the CD before starting YaST1. If you fail to do this, the search will be limited to the mounted devices (partitions).

After you have performed the search, you can ask the utility to give you more package information by pressing the **F2** or **F3** buttons. The package information will be displayed with adequate details for most applications. (See Figure 4.8.)

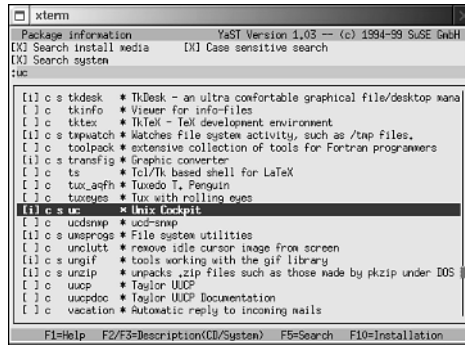


Figure 4.7

Identifying packages with YaST1.

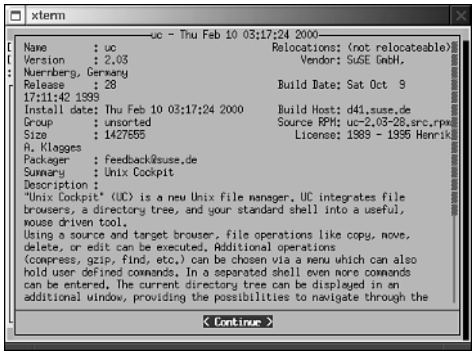


Figure 4.8

Viewing detailed package information.

With this type of information, you will not be in the dark about what you are installing on your system. If you are well acquainted with Linux applications, this optional feature may not be a necessity for you.

Building Custom Packages

The capability to build a custom configuration is a special innovation in the installation routine, for many reasons. The choices that you can make (and thereby save) will be of immense value at a later date. SuSE enables you to use the progressive option of changing the installation to suit your specific application. Rather than fumbling through a preset installation, you can fine tune your machine(s) and run the best of the best for you. The two keys to building the custom configuration are 1) changing and creating configuration options, and 2) saving the configuration to disk. You then can reuse your system configuration on other installations or updates.

Changing/Creating Configurations

This menu enables you to do exactly what is says: change an existing configuration and create a new one, if you are inclined to do so. With approximately 1,500 software packages available, this is customizing heaven.

For instance, say that you decide to use the SuSE KDE System, and you also like developing software. All you have to do is select the SuSE KDE System, load the configuration, and select the Change/Create option. Now peruse through the development series (and any other that suits your fancy), mark the applications, and strike the **F10** key—this saves the selections you've just made.

If you're a total software cowboy, you also can ride bare-back and choose to install the SuSE Minimum System and adding all the other things through the Change/Create option menu. Figure 4.9 illustrates the series selection menu in Change/Create configuration.

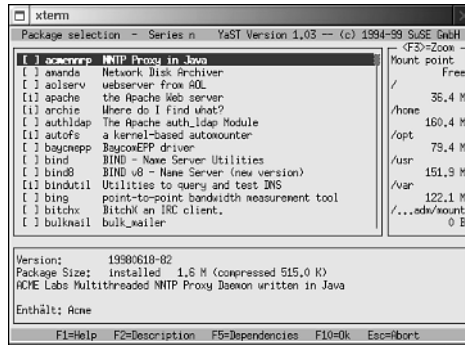


Figure 4.9

The package selector in Change/Create menu.

For reference sake, these are the indicators used by the install program:

[]	This package is not selected or installed.
[x]	This package is selected for installation.
[i]	This package is already installed.
[r]	This package is slated for replacement (update).
[d]	This package is installed and will be removed.

When you finish you package selection, strike the **F10** key and go to the main YaST1 screen. Choose Start Installation, and you'll be able to sit back and relax. The program will check for dependency problems; if any exist, the prompts will guide you.

TIP

Once you have all the software installed and you would like to have the RPM package manager check the MD5 signatures, just issue this command:

```
rpm -Va
```

Depending on the amount of software that has been installed, the process should take about 15-30 minutes on a 200Mhz Pentium machine. If your machine is rated higher or lower the time factor will change accordingly.

Available Window Managers

One of your last concerns entails selecting your window manager. This is an important decision. However, you have the choice of more than five window managers, each with a different feel. You probably will find yourself switching and experimenting with different types of window managers when using certain applications. The great thing about having more than one window manager is that you never get bored. I particularly like Window Maker and Enlightenment. Figure 4.10 shows Window Maker 0.61.

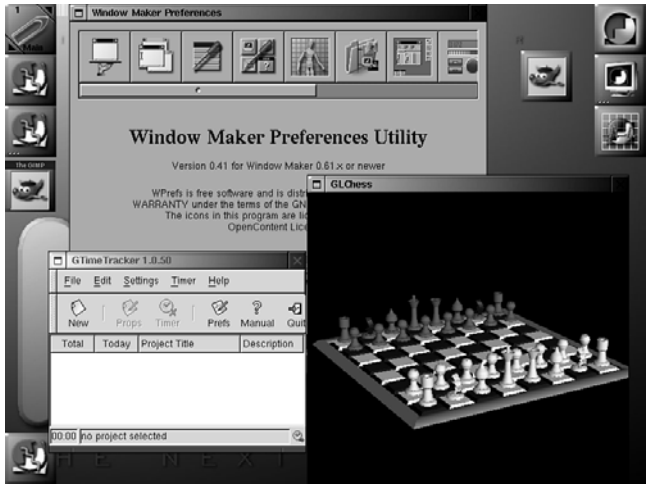


Figure 4.10

Using the Window Maker window manager.

Window Maker is fast and light. What's more, it's not a memory hog, and it has selectable background themes.

Figure 4.11 shows Enlightenment. This window manager is elegant and sweet, but it takes quite a bit of memory to draw and render adequately. Enlightenment (or "E") has a large amount of potential, but you should have more than 32MB of memory to use it properly.

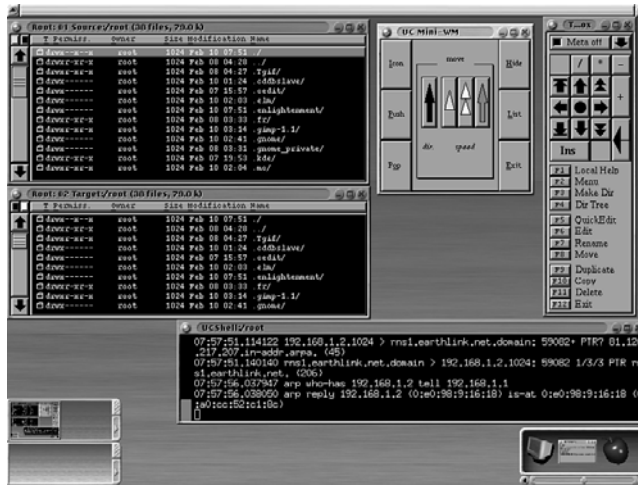


Figure 4.11

Using the Enlightenment window manager.

SuSE Linux includes FVWM, FVWM2, CDESIM (simulated CDE desktop) ICEWM, and the default KDE desktop to boot. Other window managers, such as BlackBox and a few others, also exist. The choice is yours. There are more window managers available, each with its own unique flavor and characteristics. You can find a larger selection of window managers and themes at `http://e.themes.org`, and `http://wm.themes.org`, and finally, `http://www.helsinki.fi/~raatikka/linuxwmanagers.html`.

Loading and Saving Configurations (Cloning)

Cloning is an effective way of reproducing a system configuration. SuSE has assigned the **F9** key for saving the current configuration to disk. As I spoke of earlier, the cloning technique can be utilized to enable you to install duplicate configurations on a workgroup or a network in a shorter period. The best always gets a little better.

Software Installation Summary

If you've reached this point in the chapter, you are well on your way to a new SuSE experience. Looking back, you've covered the packaging methods, the different installers included in this distribution, and how to use the package selector effectively. You've also loaded or changed your installation configuration to suit your taste. I suggest that anyone using SuSE Linux should save the install information to disk so that it can be used again. Even if you are not cloning a network, this will help in case you have to reinstall for some unforeseen reason. You also now have an idea of what the available window managers look like. All around, you should be set.

CHAPTER 5

Booting into SuSE Linux for the First Time

Your installation is now almost complete, and you are on the verge of a new Linux experience with SuSE. A few more steps must be covered, though, before you are fully prepared—if you have used the YaST2 installer, however, your remaining steps are quite short. This is because you already have configured the mouse and input other information, which will be covered shortly. Those of you who have chosen to use YaST1 will have a little more to do, but not much.

This chapter is designed to help you get started quickly and to highlight the post-installation process that SuSE uses to make sure that your system performs at its peak. The text will cover the steps required for both installation protocols. The YaST2 coverage will be more of an overview because not much of a post-install routine is involved; the YaST1 process will be more detailed.

The SuSE Linux Post-Installation Procedures

The difference between SuSE and other Linux distributions is the SuSEconfig utility, which is started every time important configurations are changed in YaST1. SuSEconfig sets up the system configuration using predetermined specifications provided in the base system. SuSEconfig also can create or modify existing configurations for software being installed, and it can perform most system configuration tasks whether you use YaST1 or YaST2. After the software you have chosen to install on your hard disk is ready for configuration, either the system

will perform the configuration on its own, or the program will prompt you and wait for your input. These are some of the files that SuSEconfig alters:

/etc/resolv.conf
/etc/hosts
/etc/host.conf
/etc/organization
/etc/nntpserver
/etc/shells
/etc/sendmail.cf
/etc/default.keytab
/var/lib/news/mailname
/usr/lib/irc/ircII.servers
/usr/X11R6/lib/X11/fvwm2/.fvwm2rc
/usr/lib/zoneinfo/localtime
/etc/HOSTNAME
/dev/mouse (sym link)
/dev/modem (sym link)
/usr/X11R6/lib/X11/fonts/*/fonts.dir
/usr/info/dir
/etc/ld.so.conf
/var/catman/index.*

It is beneficial to you for your system to know certain parameters and to handle the task for you automatically. On the other hand, this type of configuration routine can cause major problems if the system is not maintained properly. First, let's examine how YaST2 finalizes the installation.

Finishing with the YaST2 Installer

The graphical installer has the advantage of being quite a bit faster during the post-install procedure than its predecessor, YaST1. Most of the system information is input at the beginning of the install, which enables the installer to run in an automatic-type phase, with no user interaction. Linux installations are moving in that same direction: more system intervention and less user interaction.

A brief recap of the YaST2 process is in order at this point. The basic configuration tasks, such as inputting the language, keyboard type, and time zone, have been handled, and you have identified your mouse in the mouse configuration step, as shown in Figure 5.1.

You also have chosen the type of installation method, whether automatic or guided. These menus alone have helped you speed up the installation process significantly—just point and click, and you're finished. No scrolling through other menus is needed—just expediency at its best.

In addition, you've chosen the specific Target disk and used the fdisk utility, which is incorporated into the Installing On <hard disk name> selection, this has helped partition the disk according to your specifications. The existing partitions were erased, and

new ones were rebuilt. You also chose from three different types of packages for software selection: Minimal system, Default system, and Almost everything. If you chose a minimal or Default system, you might have added additional software, as shown in Figure 5.2.

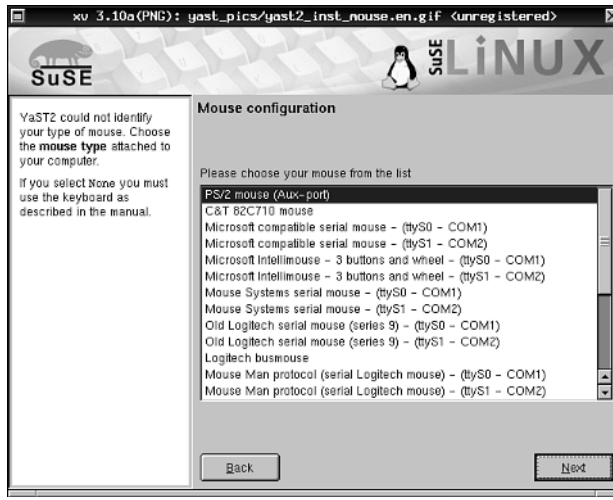


Figure 5.1

YaST2 mouse configurator.

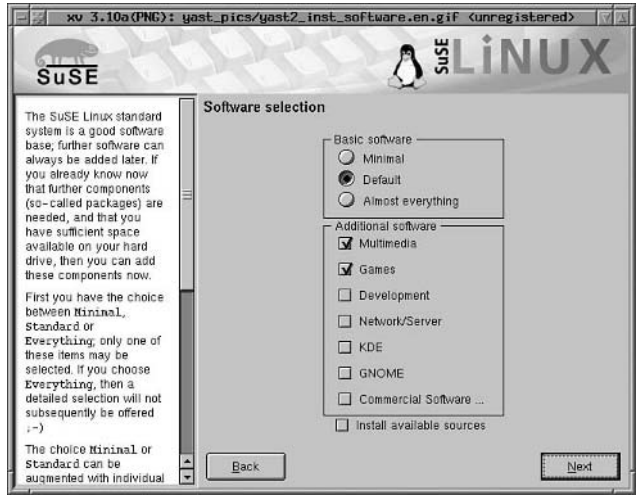


Figure 5.2

YaST2 additional software selections.

The LILO Installation screen enabled you to choose where you installed the boot loader program. In the section Personify, you have input your name, user login, and password. You've also input the password for the root user, and you have chosen the "confirm installation" selection. The software now is being installed, and YaST2 will request to boot your installed system. When it does so, it will default to a shell environment, boot the kernel, and run the init.d startup script. During this startup process, the system adds the root user and a regular user account with the name that you input during initial setup. In some cases, you might need to install additional software. You might be prompted for a second CD as well, so have both available during the installation.

When the software installation is complete, the system will ask how you want to configure the LInuxLOader (LILO) program.



NOTE

Normally, the LInuxLOader (LILO) program asks to be configured in the initial LILO installation process of the install. If the disk on which you are installing SuSE cannot be booted from the BIOS using /etc/lilo.conf, the installer will not request this information until all the software has been installed. At this point, your only choice is to build a boot disk to ensure that you will be able to access the installed system.

The system then attempts to recognize your video parameters and configure them for you. This can prove to be troublesome for some installs. The video cards and monitors are identified, but the configuration information reads in German, which I cannot understand.



CAUTION

This might have been a fluke in the SaX program, but if you happen to run into the same thing, you can abort the configuration and install your X server from the command line—just type `sax` at the command line, and the X configuration tool will start.

When the video configuration is finished, the system runs SuSEconfig in the background; the system prompt given is "Finishing the installation." The configuration utility takes care of all the trivial stuff—from setting up systemwide file permissions to modifying the /etc/resolv.conf file for nameservers, SuSEconfig does it all. Depending on your knowledge and familiarity with Linux, you may elect to modify the configuration files by hand, and that's okay—you can turn off SuSEconfig after the install scripts are run, and the system will be fully configured. If you choose to do this, no configuration will take place when software is added or removed. For the sake of a clean, reliable install, let SuSEconfig adjust the system settings in the meantime. Chapter 10, "Managing the Network Setup," shows you how to turn off the SuSEconfig utility.

You now can log on to the installed SuSE Linux system as root, and YaST1 helps you take care of your network settings. As you can see, most informational input was accomplished in the initial sequence of installation, reducing the overall time to complete the system install.

The process of finalizing the network settings after installing with YaST2 is handled by the YaST1 utility. In the effort to reduce repetition, refer to the next section, "Finishing with the YaST1 Installer."

Finishing with the YaST1 Installer

For whatever reason—partitioning, updating, or just plain habit—you've chosen the YaST1 utility to install your SuSE Linux system. Most likely, you are the type of user who needs to be involved in the system installation process to feel comfortable with the results of your effort.

As you watch the YaST1 utility install your new system, get ready to input system information during the post-install routine. Unlike the YaST2 installer, which records a portion of vital user information prior to the software installation and then hands over final configurations duties to YaST1, the YaST1 installer takes you straight through a systematic procedure of entering network, user, and device information. Essentially, you'll be involved in everything required to get your machine booted and on the network.

This section outlines in detail the post-installation process. The intent is not to be tedious or overtly elementary, but to give you a solid road map to work with in case something goes astray. This method of post-installation is performed by both YaST1 and SuSEconfig.

You will note that during the software installation process, certain packages (depending on your choices) will be noted for post-install and also will indicate that the /etc/rc.config file will be updated. These packages are applications such as pcmcia and sendmail that require some type of configuration information generated in the central configuration file. Their configuration will be handled by SuSEconfig during the post-installation process.

After the software is installed, YaST1 returns you to the main installation screen, as seen in Figure 5.3.

NOTE

If you walk away from the machine during the software installation and then return to find that all is finished, you can check whether any package failed to install by pressing the Tab key. This displays the installation log screen and any warning(s) or failed packages.

Choose the Main Menu selection to continue. If you are prompted to, replace CD number 1, and press the Enter key. The program will move to the Select Kernel screen. The first selection, Kernel with Support for Various EIDE Controllers, should work for most IDE hard disk systems. SuSE gives you additional choices, including a kernel

built for Pentium and non-Pentium (i386) processors; a kernel that has Automatic Power Management built into it, for the mobile user; and a kernel that supports SMP (multiprocessor). By pressing the F2 key, you can change the path for the kernel image and the configuration file. For most people, this will not be necessary; using the defaults will work fine. The only time this might be used is if custom or expert installations have been performed.

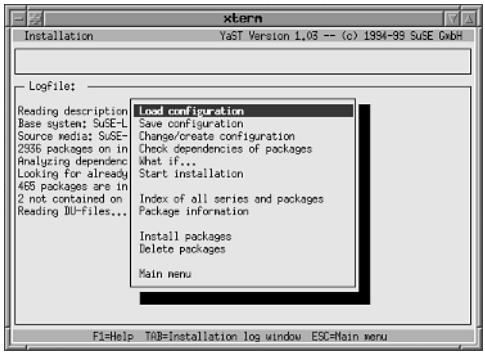


Figure 5.3

YaST1 installation screen.

After installing the selected kernel, the system prompts you to install the LInuxLOader. If you are running another operating system and are not sure whether the LInuxLOader program will work, you might want to boot your system from a floppy disk or some other means. If you are running Windows NT, refer to `http://ldp.iol.it/HOWTO/mini/Multiboot-with-LILO.html#toc4`, for details on how to configure Linux and the NT bootloader.

The LInuxLOader installation screen gives you the capability to customize your boot sequence. This menu screen is shown in Figure 5.4.

As you can see from the installation menu, if you have some additional hardware parameters that must be input, Append-Line for Hardware Parameters is the first selection in the menu. Most people bypass this unless they have special hardware devices that require acknowledgment prior to the boot sequence.

You will be able to indicate where you would like the LInuxLOader installed. Your options are as follows:

- **Master boot record**—If you have no other operating system installed on the hard disk, installing LInuxLOader on the master boot record (MBR) is recommended.
- **Boot sector of the root partition**—This can be done if the system already has a boot manager that can access any partition you choose.

- **Boot sector of the /boot partition**—Use this selection if the system already has a boot manager that can access any partition you choose.
- **Floppy disk**—This is a safe and effective way to boot your system when you are not sure whether your current system will work with the LInuxLOader. The only drawback is that you always need the disk to start your system. If this is your choice, then build at least two boot disks, just in case of a disk failure. You can change the boot time delay. The system defaults at 10 seconds, but you can change that to 0 seconds if you need to boot and go.
 Bypass the Linear selection unless you have some type of trouble booting the system. For example, I have to use this option to correctly boot Linux on my notebook, and some SCSI and RAID-0 hard disk setups and controller combinations need this feature enabled.

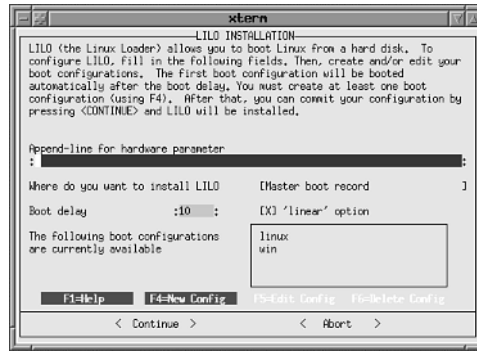


Figure 5.4

LILO installation menu.

The F4 key enables you to add or edit your selection for booting. When you choose, remember that the first selection on the list will be the default system. If you share a disk with Windows, be sure to set the default to the system most used. The F5 key enables you to edit the selection, and the F6 key deletes a configuration. Remember that SuSE provides help with most of the programs; you can access help by pressing the F1 key.

Network Configurations

The following tasks are quick and easy, and pertain to either YaST1 or YaST2 installations. This is similar to a final checklist, the last few items to be worked with prior to liftoff. This information determines the network activity assigned to this machine, the network type (such as PPP or Ethernet), and the intranet or Internet address(s) allocated to it. You will be able to start services such as Web serving and secure shell connections. To continue this road mapping, this section lists each step and offers a short explanation.

Time Zone Configuration

When configuring your time zone, the system presents a list of choices. Use the one that represents the zone in which you reside. Check `http://setmyclock.com/` if you are unsure of your specific zone.

You then can choose whether to use local or Greenwich Mean Time. Greenwich Mean Time (GMT) is part of a standard called Universal Coordinated Time (UTC), which is used to define a time that doesn't depend on one's location. This measure is used by scientists to avoid confusion of time zones. For instance, say that you're on the West Coast of the United States—you would subtract eight hours (seven hours during daylight savings time) from the GMT to get local time. When it's 01:00 GMT, then it's 5:00 p.m. in Seattle (PST), or 6:00 p.m. Pacific Daylight Time. If you decide to use GMT, you can configure you system to request the time from a global timeserver every time you reboot (see Chapter 10, "Managing the Network Setup," for details). If you choose local time, the system relies on the CMOS clock setting for its values.

TCP/IP Network Configuration

After configuring your time zone, SuSE gives you a simple, clear-cut network menu. Here you can input detailed information concerning your network environment. Settings include the following items:

- **Type of network**—Loopback (standalone), IP address will be 127.0.0.1 or "Real Network" settings. If you select the option "Real Network", the procedure requires additional information.
- **Hostname and domain name**—If this machine is to be used on the Internet and not part as of a small private network, you will need a hostname for the computer and a fully qualified domain name (FQDN) to input here. Your FQDN is the domain that has been set up by companies such as the InterNIC—for example, xyxy.com. If this is a part of a private network that will in no way access the Internet (unless by IP-Masquerading), you can input any name you like for the host and domain—elvis.hasleftthebuilding.org will even work.
- **Network interface**—You must select the type of network interface, (eth0, plip, tr, arc0) that you are using. If you are connecting computers via parallel cables (plip), the selection IP Point to Point Partners will unmask to allow you to input the other machine's IP address.
- **IP address**—This is the IP address assigned to you by the InterNIC or your local ISP, cable company, or similar entity. You must enter the netmask and gateway addresses. If you have a Dynamic Host Configuration Protocol, the program will ask, "Confirm DHCP client (y/n)," and you will need the dhclient software installed. Chapter 10 covers DHCP configuration.

A WORD ON STARTUP SERVICES

Start Inetd selection at boot time? (y/n): If you intend to use services such as printing (remote or otherwise), you'll need this service running because it responds to calls from other systems about the identity of your machine. If this machine is a firewall, you might not want to run this, for security reasons.

Portmapper start at boot? (y/n): This service is needed only if you are going to provide network services such as NFS or NIS. This, too, is not advisable to run on a firewall machine.

- **Adjust News-From address input field**—This displays the system's complete name. If this is not accurate for mail purposes, you may change it now.
- **Confirmation of nameserver (y/n)**—Input the address of the nameserver (only one at this time, if you have a secondary nameserver—Chapter 10 shows you how to add additional IP addresses). The domain name should be filled in with the domain of your system or the domain of your ISP's system.
- **Input device type and select correct driver**—The program recognizes the interface that you chose earlier and gives you a list of drivers from which to select.
- **Network now configured**—All your settings should be done, unless you have more than one NIC card or modem in the machine. If so, you will have to configure them separately. See Chapter 7, "SuSE Communication Features," for configuration details.

Logging into SuSE Linux

The SuSEconfig program assumes control of the system, writing configuration files, making adjustments, and setting file permissions.

1. SuSEconfig runs and creates new network setting and files that support it.
2. Generates new Hostname, /etc/resolv.conf, etc/host.conf, and /etc/SuSEconfig/profile files.
3. The prompt reads, "System will restart in order to commit the installation."
4. The system restarts and boots the kernel, and mounts the file system(s).
5. A new prompt reads, "Welcome to SuSE Linux."
6. The system asks for a root account password, and you must input the password twice. If you want to bypass, this step (which is not advisable), press the Enter key, and post-installation will continue. If you have a reason not to input the root password at this time, it still should be added as soon possible; refer to Chapter 8, "Managing Users and Groups with YaST," for details. (Note that for YaST2 installs, this will not be required.)
7. SuSEconfig scripts start again, and the screen reads, "YaST has to configure some things, so let's start."

Example Username and Password Feature

The Create Example User program gives you an opportunity to set up a regular account (nonroot) on the system for your everyday work tasks. (Note that this is not required in the case of YaST2 installs.)



NOTE

Creating an example user (nonroot account) might seem to be an insignificant part of the installation of your system, but be assured that it is not. In the past, distributions have had simple installation programs that took for granted the use of the system. The root account was set up, and that was it. The user would (or should have) manually set up a regular user account from which to perform daily work. This sometimes did not happen, though, and while working with root privileges, the user would execute a quick command, such as `#rm -r/`, and unknowingly delete the root partition with the recursive remove command. If the user was working in a regular account, the system would have circumvented the command and prompted the user, stating `rm -r/: Permission denied`.

Device Configuration

The attached devices must be configured, and this step will assist you in identifying and configuring these components.

- **Modem configuration**—This configures the modem(s) on your system. You will be able to choose the appropriate ttySX port. Configuring the PPP network connection is covered in Chapter 7.
- **Mouse configuration**—You can choose the type of mouse from the list of compatible types. Choose the port that the mouse will use, and test the configuration to make sure that the device works. This is important element; the X Windows system will not function without a mouse configured for use. YaST2 users will by-pass this option, you have already configured this option during the graphical install procedure.

Final Step of Post-Installation

The software now has been installed and initialized, and basic network connection(s) have been configured. YaST1 then executes its final duties and hands the system over to you.

1. YaST1 confirms that all package are installed, and then YaST terminates.
2. The program drops out to a shell-type environment. SuSEconfig sets up systemwide file permissions and mail aliases, and you will see the output of the permission setting on the screen. By default, the system is set up with easy local permissions, which means that the majority of administration tasks can be accomplished using the `su` (superuser) command from a regular account. Depending on the system's ultimate use, you can set the permissions to secure

local, which I would suggest, or use the paranoid local setting. If you use the paranoid local setting, the use of the su command becomes virtually useless and requires the user to log in as root to perform privileged tasks.

3. The post-install program informs the user that post-install scripts will be started. The install log is located at /var/log/Config.bootup and can be printed if required from console 9. (Access the console by pressing Ctrl+Alt+F9.)
4. SuSEconfig performs final configurations, and startup services are initialized. These services include printer daemon, HTTP server, and mail transport system (sendmail or postfix).
5. You now can log in as the root or example user.

Problem Logging into SuSE Linux

Your Linux system is now completely installed. You have taken care to follow all the screen prompts, but let's say that as you reboot your machine, the system does not respond as you hoped it would. The system might not boot, or if it does boot, the network connection fails. Worse yet, you might have forgotten to memorize the root password, and now you're stuck on the outside looking in.

The focus of this section is to help you identify and resolve some common problems. Because of the extent of this subject, this section gives some quick overviews and mentions various resources that will help you resolve the problem.

If you experience a problem logging onto (booting) your system, you can use SuSE's built-in rescue system on the CD that accompanies this book. Possibly, your boot loader has failed; whether it is the LInuxLOader or another type, the CD will get you up and running.

To perform this operation, you need the boot disk or a bootable CD. Insert the boot disk (or CD 2), and cold-boot the machine. Because you are already familiar with Linuxrc, move to the Main menu screen, and select Start Installation/System. The program presents a submenu—choose Boot Installed System. Linuxrc then asks for the root partition (such as /dev/hdaX). Input the information, and press the Enter key. Linuxrc uses the kernel image on the disk or the CD to initialize the system. You will need only the root password to get back into the system and make adjustments or reinstall the LInuxLOader.

Lost or Forgotten Root Password Procedure

Losing a root password is frustrating and time consuming. Fortunately, SuSE has a rescue system that can help in the times when you lose or forget the root password.

Some Linux distributions have employed the Linux single feature, a command-line argument given at the boot prompt to allow the user to initialize the system in single-user mode. This is a maintenance mode in which no password was required. SuSE Linux will boot up in the single-user mode, but it asks for the root password. This is where the rescue system comes in.

To use the rescue system, you must build a rescue disk (unless you have a bootable CD). With a bootable CD-ROM drive, cold-boot the system and follow Linuxrc to the Main menu screen; then select Start Installation/System. Choose Load rescue system from CD; the screen shows the rescue system loading into a RAM disk. When this is loaded, you can begin the task of rescuing the system. The rescue system does not require you to have a root password. You will be able to access three virtual terminals (called consoles), by using the Alt+F1 through F3 keys. The Alt+F4 key combination enables you to view log messages from the kernel and also syslog.

The rescue system includes vital system maintenance tools such as fdisk, mkfs, shutdown, mount, and umount, just to name a few.

When you're inside the system, you must mount the file systems using /mnt as a mount point. You must identify the / (root) and /usr (user) file systems (such as /dev/hda1 and /dev/hda3). Mount then using the command:

```
#mount /dev/hda1 /mnt
#mount /dev/hda3 /mnt/usr
```

You now are ready to start rescuing your system. This operation could entail file editing, however, and no file editor is contained in the rescue system. You must issue this command:

```
#/mnt/usr/bin
```

This command grants you access to editors such as vi and joe. The rescue system also contains the networking tools ifconfig, netstat, and route for network diagnosis.



NOTE

If you cannot access the CD-ROM drive, use the option Load Rescue System from Disk, and insert the rescue disk into the disk drive.

When you're inside the system, you can edit the /etc/passwd file to remove the password place marker (X), as follows:

```
root:x:0:0:root:/root:/bin/bash
```

```
root::0:0:root:/:/bin/bash
```

Restart the system. Root now can log in without a password. You should update the root password as soon as possible; see Chapter 8 for details.

BUILDING A RESCUE DISK

If you need to rescue your system and your machine is not equipped with a bootable CD-ROM drive, or if your CD-ROM malfunctions, the only way to proceed is to build a rescue disk. This disk should be used in conjunction with the standard boot disk to load the rescue system into a RAM disk. This disk is not the same as the standard boot disk used to start the system. You'll likely have to build this disk on another machine. If it is UNIX/Linux machine, insert the CD and mount the CD-ROM drive. To make the disk, use the following command:

```
# dd if=/cdrom/disks/rescue of=/dev/fd0
```

Or, issue this command from a Windows or DOS machine:

```
D:>dosutils\rawrite\rawrite disks\rescue
```

Damaged or Partially Installed

Sometimes the installation or update will not proceed. You might get a prompt similar to this, "Free list corrupt (1753864)—contact `support@redhat.com`." One noted problem stems from the RPM database being corrupted. To solve this, first make a backup of the directory /var/lib/rpm, and then issue this command:

```
#rpm --rebuilddb
```

You also might find yourself facing a bad superblock problem when the system starts to initialize. The file integrity checking system will attempt to correct minor file inconsistencies, but if the integrity cannot be restored in a normal fashion, the system will halt and prompt you with the reason why. If this happens, you will have to run the e2fsck utility to correct the file system problem.

CAUTION

When you run the e2fsck utility, you will have to specify which partition (device) you want it to check. If the file system is mounted, unmount it—the prompt will tell you that serious damage can occur if you don't. This is a fact! Issue this command:

```
# umount /dev/hda1<or appropriate designation>
```

Then continue the process.

If you encounter problems with LInuxLOader, point your browser to `http://sdb.suse.de/sdb/en/html/kgw_lilo_linear.html` and `http://sdb/suse/de/sdb/en/html/1024_Zylinder.html` for more details on what can happen with the bootloader.

Booting into SuSE Linux Summary

The purpose of this chapter was to get you through the post-installation procedure in a successful manner. Information on the setup information has been detailed, and a thorough network configuration has been outlined.

The section on problems discusses only a small portion of available information, compared to the resources you'll find on the Internet. Still, the solution given for booting the installed system and initiating lost or forgotten password procedure might save you some headaches.

For up-to-date distribution-specific issues, SuSE's online support database is current on technical problems. Check out this SuSE site: `http://sdb.suse.de/sdb/en/html/bugs63.html`. This can help in situations not addressed in this text. The main support site is located at `http://sdb.suse.de/sdb/en/html/index.html`.

CHAPTER 6

X Window System Configuration

In the past, the configuration of the X Window system proved to be a barrier to a significant number of Linux users. Some of the complexities surrounded the hardware compatibility issue. When Linux was not in the mainstream (or headlines) of computing, the hardware vendors turned a deaf ear to the small group of "hacker-types" and continued their alliance with proprietary software companies. As you read this text, however, the tide has turned; the rushing waves are now hitting the Linux shores with hurricane force. Video hardware companies are now releasing the software source code for their components so that the growing Linux community can purchase their products.

SuSE takes a step forward in helping you get the X Window system configured quickly. Some distributions end their installation with a script that sets up the video configuration file—this includes the mouse, video card, and monitor. One hitch is that, in some cases, this configuration takes place in a semi-graphical environment. The problem occurs with the monitor settings. SuSE has an advanced configuration utility that will autodetect most of your hardware, especially those pesky monitor settings. Experienced users of X configuration tools such as xf86config may never see another monitor setting parameter warning again.

WARNING

Even though the SuSE X configuration tool is advanced, the autodetect feature may fail to identify your monitor. Use caution, and supply the correct parameters—incorrect settings could damage your monitor.

The solution to the problem would be performing the final monitor settings in a full GUI environment. SuSE does this, and it solves the problem most of the time. SuSE is closely tied to the XFree86 program, which provides the X Window environment. This gives SuSE a better outlook on what is relevant to effective configuration and what is not.

Unless you have worked with XFree86 for a while, you will need some help getting the environment configured. SuSE Linux provides two means of doing this. The first is the SuSE Advanced X configuration tool; the second is the xf86config utility, which has been an old standby for several years now. For the fans of XF86Setup, this tool is now somewhat dated, and the SaX utility has effectively replaced it.

SaX X Window Configuration Utility

SuSE has developed a high-quality X configuration tool called SaX. This tool initiates a full GUI environment on your computer monitor and leads you through the task of final configurations. SaX autodetects the mouse, recognizes that you have a keyboard attached (you'll have to specify what type), probes your video card, and determines the type and chipset. SaX also obtains information from the monitor so that you have some baseline parameters to work with. Put all these things in one package, and you have the most efficient X configuration tool available.

NOTE

If you have used the YaST2 installer, you will still need to configure your graphical working environment with the SaX or xf86config tools.

To use the SaX utility, you will first need the sax package and at least the svga or xvga16 (X server packages installed the install program defaults and uses these two servers anyway). By the way, if you have not installed an X server, YaST will automatically install the appropriate server for you. If this is your first time using and/or installing Linux, remember to have all the hardware specifications in front of you at this time. You might not need these, but have the specs ready just in case (see Chapter 1, "Assessing the Platform").

You can access SaX two ways: with the menu selection in YaST1 or from the command line. To use YaST1 interface, issue this command:

```
# yast
```

The YaST1 interface will start up; choose the selection System administration. While in the System administration menu, choose the Configure XFree86 selection. Figure 6.1 shows the confirmation screen for the configuration of XFree86.

If no X server has been configured, the screen will go blank and then the SaX utility will start a generic (SVGA or XVGA) X server. The SaX utility goes through the detection features and presents you with the main menu, which starts with the Mouse Settings screen. Here you can make adjustment with the Expert menu or choose the default settings. Figure 6.2 shows the Expert settings for the mouse.



Figure 6.1

Configuring the XFree86 server with SaX.



Figure 6.2

Expert setting for the mouse in SaX.

When you have selected the correct mouse, you can move on to the keyboard configuration by using the mouse to click the Next button at the lower-right corner of the SaX menu.

The keyboard configuration enables you to choose the model and the language, and offers you a test field to check the keymap. Clicking the Next button again takes you to the video card menu.

Configuring your video card should be a snap because the card should have been autodetected by the system when SaX started up. Your card memory and the X server required to run X should show up in the Info field on the menu. If the Info field does not contain the correct information, or if it contains none at all (because of an undetected card), you can use the Expert menu to input the specifications required. The Expert menu is shown in Figure 6.3.

If you had to use the Expert menu, those video card specifications probably came in handy. Let's move on to the monitor configuration.

The monitor information should be shown in the Info field of the configuration menu. SaX should have detected the horizontal and vertical sync rates. You will need to select a monitor vendor; if your vendor is not on the list (and you have a standard desktop monitor), use the !!!VESA!!! selection, and choose the appropriate resolution rate from the column on the right. Last of all is the desktop configuration.

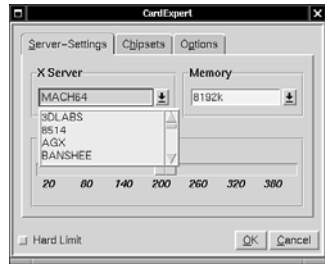


Figure 6.3

Configuring your video card in the Expert menu.

To configure your desktop, input the maximum available colors and the standard resolution rate. Click the Configure This Mode button. SaX gives you a pre-X server start message and also gives you instructions on how to kill a corrupted X server if needed (Ctrl+Alt+Backspace). SaX then starts your X server and allows you to adjust the screen position. Look for the small white rectangles on the corners of the displayed X server, and line them up with the corners (edges) of the viewable portion of the monitor. If all is well, the program will quit and you will find yourself in the YaST1 installer or at the command line, where you can type **`startx`** to start your new X session.

You will see four selections at the top of the SaX utility. The File option saves your configuration and exits the utility. The Settings option enables you to edit some of the X server features (this varies between systems) and test the edited configuration. The third option, "Infos", shows you all X server messages. You can debug some common configuration problems with this feature. "Infos" gives you detailed system information, such as the PCI, ISA, and Ethernet information. You can also rescan the system to identify the X server card memory and RAMDAC information. The last feature is the Help feature. This Help utility can be handy because it contains some of the undocumented SaX command arguments. It also contains some monitor configuration details.

The other way to run the SaX utility is from the command line. To invoke SaX, just type this at the command line:

```
# sax
```

This command starts SaX; its operation is the same as if you called the program from the YaST1 utility. From the command line, you can try the optional arguments that are found in the Help option of SaX.

SaX2

For individuals who need to test the outer limits of their computing experience and stay on the cutting (sorry, bleeding) edge of X technology, I suggest trying the servers in the XFree86 4.0 version. This long-awaited release is upon us, and along with the

necessary files and modules (yes, XFree86 is modular, as promised) to run version 4.0 comes a new version of SaX called SaX2. If you think that SaX is simple to use, try SaX2. SaX2 gives you a fancy splash screen when it starts up and performs autodetection of your hardware. It then presents a GUI environment, which looks similar to the YaST2 installer. The configuration options remain the same. The only change is cosmetic upgrading to the GUI. These software components can be found at `ftp://ftp.suse.com/pub/suse/i386/X/Xfree86/Xfree86-4.0-SuSE`.



NOTE

I tried the new X servers on my notebook, and almost everything works well except for two things. First, the susewm feature in the System Administration menu is inoperative. Second, you can no longer invoke a different window manager by issuing this command:

```
#startx <windowmanager>
```

If you need to change the system-wide window manager settings, use the DEFAULT_WM setting in the Configuration Files menu.



CAUTION

Please be sure to note the warning by SuSE—these new drivers are experimental, to say the least. If you choose to install them, use a machine that you can afford to be without, in case of the worst.

Xf86config Utility

If you have trouble configuring your graphical environment with the SaX or SaX2 tools, it may be necessary to use the xf86config utility. Although I like SaX, I can run xf86config with my eyes closed (sort of). The following list contains the essential information required to use the xf86config utility:

- You must be able to identify your mouse type.
- Indicate if you want a two-button mouse to emulate a three-button mouse.
- Input the device name (defaults to /dev/mouse).
- Choose to adjust your keyboard map with xmodmap (y).
- Select the proper keyboard (you have 12 types to choose from).
- Input your monitor specification (do *not* guess on this).
- Input your monitor sync rate (do *not* guess this, either).
- Type in your monitor vendor name (optional).
- Check video card database (y).
- Choose the correct video card from the list (very important).
- Select your default X server.
- The system will request symlink to /var/X11R6/bin (optional).
- Indicate the amount of video memory you have.
- Type in the name of your card manufacturer (optional).
- Enter your clockchip setting, if known (I usually bypass this).

- SuperProbe will probe your card for additional information (n).
- Set your monitor mode(s). Read this section carefully.
- When changing modes, you can also select Virtual Screen. This feature provides a extended desktop work area when you have a small screen monitor.

The XF86Config File

The xf86Config file is generated by xf86config. This file contains information on items such as files, ServerFlags, pointers, the keyboard, the monitor, and some other choice information. The content of this file is in-depth and is outside the scope of installation. If you encounter problems with your X configuration, refer to the site listed here. The PC help site, located at `http://www.computers.iwz.com/linux/xcfg.html`, will help you with common error messages in X and some of the simpler configuration problems—especially problems that are common to those who are using Linux for the first time. The second site is SuSE's modeline HOWTO, at `http://sdb.suse.de/sdb/en/html/maddin_videomodes.html`; this document will give you details on how the xf86Config file is structured.

X Options and Default Settings

When you installed your software, you may have selected one or more window managers. The window manager supplies the look and feel of the work environment. SuSE supplies such a large array of software; choosing among them can be hard.

When I say "look and feel," this refers to the overall characteristics of the windows, the menus, the title bars, and the way the mouse operates. Some window managers such as Enlightenment, by default, requires the mouse pointer to reside in the active window. Window Maker's menu selection is handled with the right mouse button rather than the left. The majority of window managers can be reconfigure to suit your taste. So how do you choose from the all the selections? Trial and error. The one thing that is common on SuSE Linux is this fact: If the KDE program is selected (either by choice or default), issuing this command automatically starts the KDE window manager:

```
# startx
```

You chose to use FVWM or Enlightenment, and then you will have to specify on the command line, as follows:

```
# startx fvwm
```



If you are a fan of the Window Maker window manager, you will find that typing **`wmaker`** after the `startx` command does nothing. You will need to type this at the command line:

```
# wmaker.inst
```

This runs the install script for Window Maker. You should have no problems restarting it after this is done.

Using YaST1 to Configure the Display Manager

Some of the other major Linux distributions will automatically set up your login environment. The default choices are two: either a full GUI login environment provided by the respective display managers, KDM (KDE), and XDM (Standard X Display Manager); or a nongraphical console environment. If you decided to change from GUI to console, you would have to modify the startup parameters. Where are these files located? If you use YaST1, you don't have to worry about it. Invoke YaST1 and select System Administration, and then choose Login Configuration; you'll be able to change it from there. Make sure that you have a running X server; then choose between KDM or XDM, and you will be set. This selection also enables you to change the shutdown permissions that are granted on the GUI login display. Figure 6.4 shows the YaST selection screen for login environment(s).



Figure 6.4

Selecting the default login GUI environment.

Fine-Tuning with susewm

SuSE continues its trend in setting the standard for systems configurations with a tool called susewm, or SuSE window manager. This tool is accessed through the YaST1 interface and enables the user to change the default window manager. This can be done for system-wide configuration. The system also generates configuration files and menus for the specified window managers. This helps some facilities that would like to have the same "look and feel" on all the machines on the network. You can access this selection through the System Administration menu—select Settings of susewm, and you will see the screen shown in Figure 6.5.

Remember that this will affect the window manager startup on all the machines that are connected by an X session.

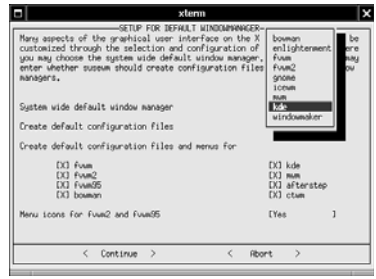


Figure 6.5

Setting the default window manager with YaST1.

KDE

Today, KDE is one of most popular contemporary desktop environments for SuSE Linux work environment. KDE is addressing the need for an easy-to-use desktop for Linux users; although it is similar to the desktop environments used by the Window95/NT, it provides greater flexibility. Because Linux is on the rise and is now considered one of the most stable operating system available today, the need for a strong desktop has become evident. KDE is trying to fill this gap and is helping Linux find its way onto the desktops of the typical computer user in offices and homes.

KDE's goal is to create a high standard in desktop applications, thus moving the UNIX/Linux desktop closer to the center of the computing industry's mainstream. Figure 6.6 shows the KDE desktop.

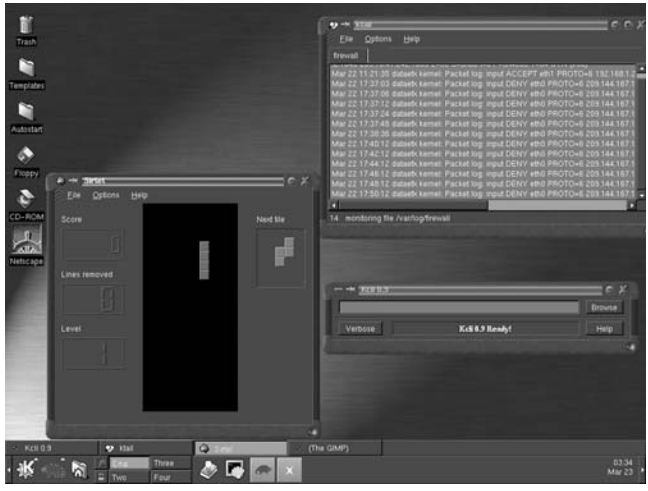


Figure 6.6

Viewing the KDE desktop (Bryce Theme).

The KDE desktop provides applications for Internet connectivity, games, and programming interfaces for the GUI environment. If you are looking for a rock-solid desktop for your Linux machine, KDE can be your solution. You can get more information on KDE at `http://www.kde.org`. This web site will keep you up to date on all the KDE happenings. For detailed information on configuring KDE. point your Web browser to `http://www.kde.org/documentation/userguide/index.html`.

Enlightenment

Enlightenment is a window manager for X that is highly configurable in "look and feel." The developers say that in the "look" department, their work is pretty much done. This window manager enables you to design your own window borders and menus, and program other elements of your screen to look any way you like. The great thing is, you don't have to touch one line of code, and you won't have to recompile anything. It takes only the ability to use an image drawing program such as GIMP and then edit some configuration files.

The Enlightenment developers are designing Enlightenment as a "desktop shell." It will manage your application windows and have the capability to launch program applications; somewhere in the future, it also will manage your files. Figure 6.7 shows the Enlightenment window manager.

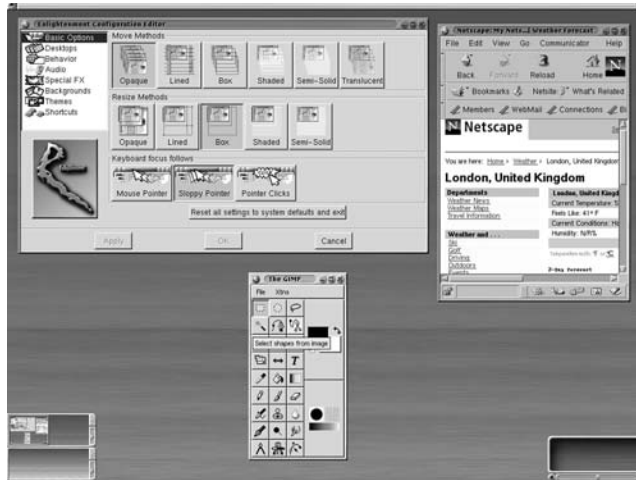


Figure 6.7

Viewing the Enlightenment desktop.

The program continues to pass milestones and is becoming faster and lighter on system resources. The one developmental hindrance is its uses of system memory; one of its highlights is that it grants you management of themes (backgrounds, menu borders, and the like). The Web site for Enlightenment is located at `http://www.enlightenment.org/`. All current news and downloads can be found there.

For additional documentation and an FAQ, point your browser to `http://e.lostworld.net/docs.html`. The site for additional themes for Enlightenment is located at `http://www.ethemes.org`.

X Window System Summary

In this chapter, we looked at one of the most-talked about items in Linux, the GUI environment. Some of the talk is positive and developmental. Seeing the SuSE Linux OS make it to the desktop is going to take a focused effort. We've gone step by step through the SuSE Advanced X-configuration tool, which proves to be in a class by itself. You can now look forward to getting your X Window System up and running, rather than grimacing at the task. We also took a peek at the available window managers and learned how to use YaST1 to change the system-wide window manager defaults. You now have the information on how to start in a console and a full GUI login. SuSE supplies the KDE and Enlightenment window managers, which are powerful work environments—either choice will be a good one. May the source be with you!

CHAPTER 7

SuSE Communication Features

Connectivity, con·nec·tive (k…-nµk"t¹v) adj. 1. Serving or tending to connect. —con·nec·tive n. 1. One that connects.

This definition is what the Linux operating system represents: The connecting of individuals, whether in a small network scenario or in a huge wide area network, such as the Internet. Linux has connected more people in the last few months than it has in its previous nine years of existence. Companies, corporations, and even nations are taking a closer look at Linux. In addition, NASA is ordering nearly a thousand laptops to use in the space program, and the National Security Administration has contracted a private sector security firm to design a bullet-proof version of Linux. In a recent survey, more than 23% of all server applications were reportedly being run on some type of Linux system. As evidence, Internet service providers such as Hurricane Electric, a high-volume, self-service type of Web server company (`http://www.he.net`), uses Linux-powered servers.

Linux is synonymous with large network connectivity. Just imagine: Without some type of network connection, this incredible operating system probably would have remained in the hands of only a few people. In the elementary stage of networking, serial and parallel port cables connected computers. Trends changed, though, and the telephone system became another vehicle to transport network data. Fiber optic technology was introduced, and this helped create a huge computer network that stretched across state lines and country borders. The Information Superhighway, as it was coined, brought access to the world wherever a telephone line was capable of

connecting to a computer. The transfer of data over the telephone line created an interesting situation, however: The telephone system spoke a different language than the computer. The phone system and the computer system needed a translator. Thus, the modem was invented.

A modem is a device that converts data from one form into another, as from a form usable in data processing to another form usable in telephone-type transmissions. The computer produces digital signals that the modem translates to analog signals, which then are conveyed across the phone lines. This small device relies on the Point-to-Point Protocol (PPP), a method for communicating between two computers using a serial-type interface, typically a personal computer connected by phone line to a server.

As an example, Brand X Internet server provider might provide you with a PPP connection so that the provider's server can respond to your requests. The server then passes your requests on to the Internet and, in turn, forwards your requested Internet responses back to you. PPP uses the Internet protocol (IP), which sometimes is considered a member of the TCP/IP suite of protocols. Relative to the Open Systems Interconnection (OSI) reference model, PPP provides Layer 2 (data link layer) service. It packages your computer's TCP/IP packets and forwards them to the server, where they actually can be distributed via the Internet. This is a model of the basic dialup-type connection. The maximum connection speed is (at this point) about 56Kbps, depending on the phone connection and the line quality.

Today computing has moved far beyond the 4800 or 9600 baud rate modems that prevailed when I started using BBS services. My current connection is a high-speed cable modem that transfers information at almost 600kbps. Telephone service providers can supply even 1.5Mbps on a standard telephone line. DSL technology uses untapped digital-only bandwidth available on current telephone lines that at one time provided analog telephone service alone. ISDN, DSL, cable and even satellite connectivity solutions abound as well, and the advent of the "wireless" LAN is upon us. (Check out the Wireless LAN and Linux resource page at `http://www.hpl.hp.com/personal/Jean_Tourrilhes/Linux/`.) Every day, another form of network connection seems to be added to the list.

How will the multitude of connection protocols affect your SuSE Linux system? Well, I have good news: The distribution you have will help you to connect and configure just about any type of dialup or full-time network connection.

Of course, how you connect to a network will be an important factor. In the past few years, modem connections have been used for a major portion of applications. Quite a few companies relied on this type of technology. Although it was a reliable form of communication, it was extremely time consuming. For example, two companies that I worked for used modem connections to upload and retrieve information from offices located out of state. Because of slow connection speeds, the network transaction took place late at night or very early in the morning. This gave the MIS department an opportunity to transfer files, and configure the system without interrupting the normal corporate work routine. By comparison, the modem speeds available today help companies transfer data and continue working throughout the day.

Modems serve as the connection medium for a large part of the networking market. Just think, your local ISP is probably equipped with a number of modems, each of which is used by hundreds or even thousands of people as a link to the Internet.

Naturally, SuSE understands that more than one connection method will be used, so I'll start with the modem connection and move on from there.

Minicom Utility

Minicom is a basic text-based modem control tool, and it has a terminal emulation that supports the vt102 screen-type and keyboard emulation. It features upload and download capabilities and several different modem protocols. If you are familiar with setting up modems from a base configuration, Minicom configuration options includes features such as serial ports, modem init strings, and chat scripts, which can supply authorization information. This is useful if you are connecting to a system that requires chap- or pap-type password recognition.

To invoke Minicom, issue this command:

```
minicom -s
```

By choosing the File transfer protocols selection, you will be presented with the transfer protocol setup screen shown in Figure 7.1.



Figure 7.1

Setting up Minicom File transfer protocols.

To inquire about the setup commands, type this at the command line:

```
minicom -h   for help
```

Or, try the man pages for better details:

```
man minicom
```

For more help with setting up a modem connection with Minicom, point your browser to `http://howto.tucows.com/LinuxGuide/linux-ppp.html`. For additional help setting up modems, go to `http://www.linuxdoc.org/HOWTO/PPP-HOWTO-14.html#manual`.

ISA Plug-and-Play Modem Setup

The ISA plug-and-play card was designed to reduce the conflicts caused by different devices using the same I/O and/or IRQ. The premise behind the card operation was that if the computer system (BIOS) or the operating system could configure the device (modem, sound card, or video card), the use of jumpers would be eliminated. With other operating systems, this might have proved convenient, but with the Linux kernel, some of these devices are still problematic.

Some newer modems use a plug-and-play type of configuration. This causes problems when the SuSE Linux kernel hardware detection fails to locate the modem in question. If your machine is equipped with one of these goodies, you'll need to do a little work before it's recognized by the system.

Setting up your modem should not take long—just follow along and you should be able to connect shortly. Included in this distribution is a tool kit called isapnptools, which includes the pnpdump and isapnp utilities. These utilities help locate and configure plug-and-play devices. To start the process of setting up the modem, you'll need to use pnpdump. This nifty tool probes the ISA devices on your computer. To start, access the command line or xterm, and issue this command:

```
pnpdump > /etc/isapnp.conf
```

This will produce a file called isapnp.conf in the /etc directory. You can load your favorite editor, locate the device parameters, and uncomment the appropriate values (I/O and IRQ). The card should be acknowledged during the next bootup.



WARNING

Be warned: If you *must* use an ISA plug-and-play device, some cards don't seem to follow the ISA-PnP implementation standard that has been established—this can cause unforeseen problems. Automatic configuration and administration of ISA-PnP card resources by the BIOS should not be used under Linux. It's recommended that you deactivate the ISA plug-and-play feature in your BIOS.

Your isapnp.conf file should be read automatically on reboot. If the correct lines have been uncommented, you should be able to configure your modem through YaST1. Be mindful, though, that some of the ISA-PnP modems can be Winmodems (bad-news items)—check to make sure that they're not. For additional information on plug-and-play configuration, see the SuSE Web site at `http://sdb.suse.de/sdb/en/html/rb_isapnp.html`. The official home page for the isapnptools kit is `http://www.roestock.demon.co.uk/isapnptools/isapnpfaq.txt`.

Dialup Networks

Dialup networking is currently the most commonly used type of network connection. Homes and businesses rely on the telephone line and their modems to assure them of outside contact. Whether used to obtain e-commerce types of services or to shop on the World Wide Web, the dialup system is the most convenient and least expensive connection method.

As with other connection methods, dialup networking (DUN) has benefits and detriments. Dialup machines are not (by function) suitable for tasks such as Web page serving and mail server applications. I liken DUN to living in mobile home. Your home is the same if you happen to move to Arizona, New York, or Kansas—just the street address changes. The same principles are exhibited in DUN. Your computer remains the same, but every time you reconnect to your ISP, your address changes. On the other side of the coin, when you make that connection between the ISP and your machine, you "own" that connection until it's terminated. This type of networking might be good for small businesses that communicate on an office-to-office basis. The security is manageable, with no 24x7 connections to monitor, and the IP address changes each time, making a break-in somewhat harder.

The biggest hurdle that most newcomers had a few years ago was getting their modems configured and connected. It was no fun having a powerful new operating system and not having the capability to connect to the Internet. If you needed help, there was a good chance that you were forced to use another machine to get online for additional assistance. In the early stages of development, dialup-type configuration programs such as dip attempted to help, but they all fell a little short. Fortunately, as the Linux user base has continued to increase, applications to make modem configuration easier are being developed in short order.

SuSE has incorporated into YaST1 an effective set of tools to get your DUN connection going. YaST1 has a menu option for modem selection, which assists you by accessing the wvdial program screen. The post-installation program offers you a chance to set up your modem. If you've waited until now to do so, don't worry—YaST1 will give you a smooth interface to work with. (See Figure 7.2.)

Wvdial Modem Configuration Tool

The Wvdial utility is an excellent tool when it comes to getting your modem up and running. The Wvdial utility scans all the open /dev/ttySx ports (except for the /dev/mouse symlink port); if a configurable modem is found, it tests the parameters and dumps the information into a file called /etc/wvdial.conf. Yes, YaST1 should do all these things invisibly, but in case you need to tweak or modify your settings, this is good information to know. Figure 7.3 shows the YaST1 Wvdial interface with the system information.

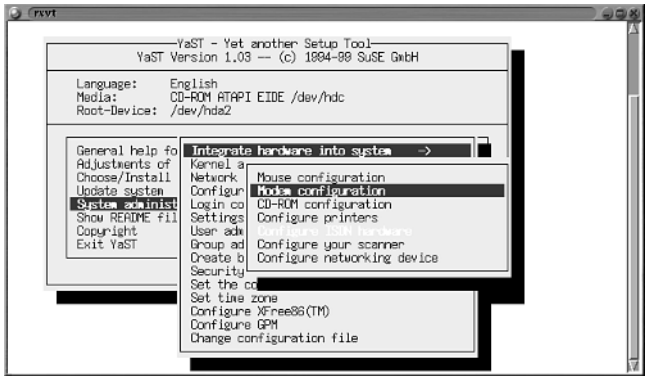


Figure 7.2

Selecting modem configuration with YaST1.

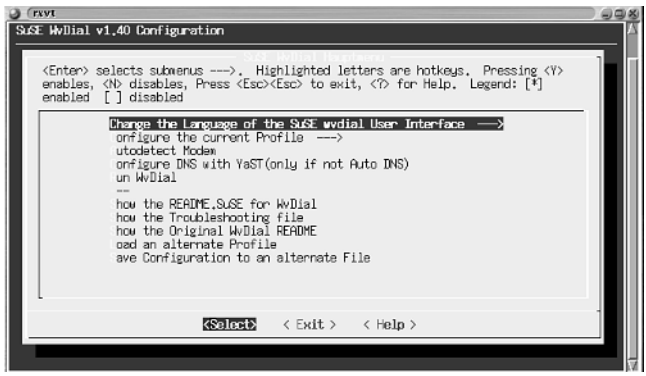


Figure 7.3

Configuring your modem with SuSE's Wvdial configuration tool.

Remember to have all the pertinent information necessary to set up your PPP connection, including telephone number, IP addresses (if required for nameservers), username, and password.

NOTE

Find out what type of authorization (login) is required by your ISP's software. The SuSE Wvdial menu enables you to choose your login type and whether it is non-standard or pap/chap type. This information is important—without it you will fail to connect.

When you've finished the modem setup, your wvdial.conf file will look something like this:

```
[Dialer Defaults]
 Modem = /dev/ttyS2
 Baud = 57600
 Init = ATZ
 Init2 = ATQ0 V1 E1 S0=0 &C1 &D2 S11=55
 ; Phone = <577-0000>
 ; Username = <elvin/DTE>
 ; Password = <S2@*^ocx4!>
```

You should note that after the heading [Dialer Defaults], the first four parameters may be a little different because Wvdial will autodetect the modem(s) on your system.

To use the SuSE Wvdial configuration tool included with YaST1, select Network Configuration and Configure a PPP Network. If you change modems and they do not use the same IRQ, select the Integrate Hardware into System option, and change the port to correspond with the new IRQ.

SuSE has provided a substantial amount of information in reference to Wvdial. You can view the documents by selecting the Help feature when using the Wvdial modem configurator. For difficult or extraordinary modem configurations, the expert menu is included. (See Figure 7.4.)



Figure 7.4

Using SuSE's Wvdial modem configuration tool for experts.

There shouldn't be any reason to use the experts menu—use it only in those rare cases when all else fails. The Wvdial utility should detect and configure just about any modem except Winmodems, but that's another issue altogether.

If you need to configure Wvdial from the command line for some reason, you can invoke the configuration features by typing this command while using the root or superuser account:

```
wvdialconf  <config file location>
```

Adding the Nameservers Addresses

Be sure to have the correct address to the DNS nameservers for your ISP. You can obtain this information from the ISP's support department. It is imperative that at least one IP address is added to the DNS nameservers input screen if your have more than one IP address (some ISPs will give you a primary and secondary address to input). Without this information in /etc/resolv.conf, you will not be able to access the network.

Adding a Network Interface

If you are planning to set up multiple modems, such as the Digiboard or Stallion types of multimodems, you'll need to set up different interface options for them. You can use the point-to-point (PPP) scheme and start with ppp0/ppp1, and add more as required. You can do this with the YaST1 utility via the Integrate Hardware into System and Configure a PPP Network selections.

Automatic Redial

If you are familiar with Linux in general, you'll know it contains a feature that will redial your ISP, in case the connection is broken. That enhancement is built into the Wvdial program. This feature is useful if your ISP shuts off your connection after a certain period of time, or if your phone line quality is bad and your modem has a problem negotiating a clean connection. After configuring Wvdial, you can connect to your service provider by issuing this command while using the root or superuser account:

```
wvdial
```



NOTE

If you in invoke Wvdial from an xterm session or while on the console, it will not automatically move into the background, i.e. your prompt will not return until the Wvdial program is terminated. If you would like to continue working, without starting a different xterm or CLI session, issue this command when starting Wvdial:

```
wvdial &
```

The Wvdial utility will dial up in the background, and you can continue working. When necessary, return the program to the foreground and shut down the dialer with Ctrl+C. Then wvdial will state, "Caught signal #2, exiting gracefully… ."

For additional information and updates concerning wvdial, you can consult the main site at `http://www.worldvisions.ca/wvdial/index.html`.

Cable Modem Setup

Cable Internet service has taken the industry by storm. Although it competes with high-profile telephone companies, it has drawn a substantial following. What better than to have Internet access and cable TV at the same time? The bandwidth implications are real, but unless you are in need of a dedicated T1 line or require connectivity for a VPN that carries a large amount of secure traffic, cable connectivity may be just the ticket. If you're presently using cable, you already know the benefits. You have the advantage of high-speed data transfers and no dial-up connection problems to deal with, you are always online, ready to go. There is one element of cable I am still leery about, though: the shared bandwidth factor. In Figure 7.5, NetWatch shows you my surrounding traffic.

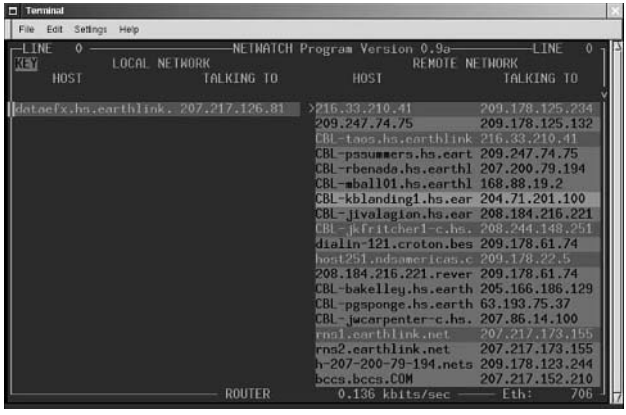


Figure 7.5

Viewing network traffic on a cable type Internet connection.

Most cable Internet providers do not support Linux as a viable platform, although this only due to the fact their staff might not have the skills to help the growing Linux community. During my installation, I used my laptop and configured it to boot Windows only. The whole thing went smoothly—I had a fast Windows machine, so I proceeded to set up SuSE Linux on my gateway box.

Most cable modem installations require a network interface card, which connects to the cable modem itself. Not much is involved in the actual configuration. Most cable modems have a built-in self-configuring feature, for this reason: You are residing on a common network, so the responsibility of IP address allocation is up to the cable company's network. Therefore, the cable network must "talk" to the modem to validate your connection. The only thing that is left is the selection of a quality network card(s).

Getting this setup working normally takes just a few minutes. I'll give you a list-type overview of the process, however, because systems may vary.

1. Start YaST1 and access System Administration.
2. Select Integrate Hardware into System, and assign card(s) type and parameters.
3. Select Network Configuration, and input network address information from your cable company.
4. Restart the computer, and you should be ready to go.

This is a simple example of how cable modems can be set up, although some other factors are involved with setting up a cable modem. If the cable requires the DHCP protocol, you will have to install the client software from series n, called dhclient. For further information on DHCP setup, access the documentation available on your installed system by typing at the command line one of the following:

```
man dhclient
```

or

```
dhclient-script
```

For information on the configuration file content try this:

```
man dhclient.conf
man dhclient.leases
```

Several articles cover the development and use of cable-type technologies. One, called *First Principles*, can be found at `http://www.ozemail.com.au/~firstpr/bband/`. In addition, the current Cable Modem HOWTO is located at `http://www.oswg.org/oswg-nightly/oswg/en_US.ISO_8859-1/articles/Cable-Modem/Cable-Modem.html`. The HOWTO above is current, providing extensive and in-depth details that cannot be covered by the scope of this chapter. If you happen to run into some sort of hangup, this is the first place to look for a solution.

ISDN Interface Setup

Integrated Services Digital Network (ISDN) was a highly touted method of networking until the DSL and cable revolution hit. The ISDN technology utilized dialup type access and per-minute and per-mile charges. This type of high-speed network connection was not economical enough for the average household or small business, though.

Thus, ISDN's tenure as the ideal type of connection was short–lived when BISDN quickly came on the scene. BISDN is a concept and also a set of services that have developed standards for integrating digital transmission services in a broadband network of fiber optic and radio media. BISDN is used in conjunction with ATM technology and Frame Relay services for high-speed data that can be sent in large bursts. The BSIDN (and ATM) communication layer is set on top of SONET (Synchronous Optical Network), which helps provide the high-speed characteristics. BISDN supports data transfers from 2Mbps and up. This is a great service, but it will take serious technology changes to be implemented. The components to support ATM technology and

frame relay are being built into the present kernel, and hopefully more ax.25 and ATM support will be available for the high availability market.

ISDN can use two types of interface technology, one of which is called a terminal adapter (T/A). Essentially, this is just a fancy name for a modem that has digital capabilities. A T/A operates similar to a conventional modem, so getting one up and running is a straightforward process. T/As are available in internal and external configurations. For full details on most of the ISDN T/As available, point your browser to `http://alumnus.caltech.edu/~dank/isdn/isdn_hw.html#TA`. This page contains information that may be vital to getting the right adapter, and it can help you configure the performance aspects.

The other type of ISDN interface is a controller. ISDN controllers are designed to handle multiple ISDN connections in a LAN or VPN-type environment. These controllers can provide a vast amount of services. If you are looking to connect your system or business with ISDN, try looking at 3Com's site at `http://www.3com.com/products/dsheets/400396.html`.

Current technology allows multiple connections at the controller. You can configure your system to use Ethernet card(s) and hubs and also to have connections for your regular analog phone and fax machine, all from one ISDN line.

To use an ISDN controller with SuSE Linux, you first must note what type it is, active or passive. If it's a passive controller, install the i4l software package, located in the n series. For active ISDN controllers, you should install i4lfirm.



NOTE

For those who are considering an ISDN connection, passive controllers require user interaction by selecting a prearranged outside number and then waiting for the system to respond. An active ISDN controller uses the dial-on-demand procedure. The Wvdial utility included in this distribution can be configured to operate in a dial-on-demand environment. The details are available at `http://sdb.suse.de/sdb/en/html/hoe_wv_dod_start.html`. This will establish automatic network connections in cases such as when a Telnet session is started or when a Web page is requested by the Web browser. When the connection session is terminated, the link will shut down in a predetermined amount of time.

When the software has been installed, you can use YaST1 to help you configure the adapter easily. Figure 7.6 shows the ISDN setup screen.

If you are changing distributions and are already running ISDN as your main source of connectivity, you have all the network information available to you. If not, gather all the required network information before adjusting your settings.

SuSE includes a package called isdn4linux, which is a fairly complete setup in itself. It has hardware and software drivers and modem emulation for digital modems.

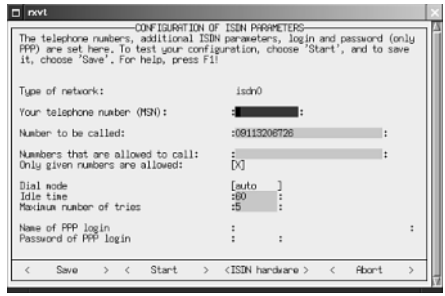


Figure 7.6

Configuring ISDN parameters with YaST1.

Certain ISDN controllers may pose some configuration problems. The ISDN drivers are loaded as modules and sometimes, depending upon the controller, the kernel may not recognize the device and fail to load the HiSax module. Some of the affected units are the ICN and the AVM-B1 controllers.

The SuSE site has complete details on setting up controllers for ISDN services. See the URL `http://sdb.suse.de/sdb/en/html/isdn.html`, and also see `http://sdb.suse.de/sdb/en/html/isdn_trouble.html`. These two resources will assist you in resolving some common ISDN connection problems.

DSL Modem Interface Setup

Digital Subscriber Line (DSL) service has greatly influenced the computing world at large. The performance that DSL offers is incredible. With data transmission speed close to that a dedicated T1, and at a fraction of the cost, what other dream could come true?

Presently, cable modem Internet service has taken the leading edge in the competition, but the expected growth of DSL after the year 2000 will overtake the competition. Setup and configuration of the DSL modem are similar to that of the cable modem.

Because most DSL service actually is Asymmetric Digital Subscriber Line (aDSL), your upstream and downstream speeds may differ. Look over this as an example:

Access Speed	*Upstream Speed*	*Downstream Speed*
256kbps	256kbps	256kbps
384kbps	384kbps	128kbps
384kbps	384kbps	384kbps
384kbps	384kbps	1.5Mbps

The equipment used for DSL, if the phone company supplies it, should work with no hitches. If you intend to use the DSL line for voice and data (and if you're having the installation done by the phone company), the installer will insert an additional device called a "splitter." This is a small jack type of connection that has two outlets, one for

an ordinary telephone line, and one that connects to the DSL modem. If you have a splitter, make sure that the DSL modem is connected to the correct outlet. Otherwise, just connect the DSL modem directly to your DSL line. When the DSL modem acknowledges the network, you are ready to start your configuration(s).

1. Start YaST1 and access System Administration.
2. Select Integrate Hardware into System, and assign card(s) type and parameters.
3. Select Network Configuration, and input network address information from your telephone company.
4. Restart the computer, and you should be ready to go.

For you adventurous types who want to do the installation from the ground up, look for direction in the HOWTO located at `http://www.linuxdoc.org/HOWTO/mini/ADSL.html`.

Some low-end DSL plans are convenient for home users. However, the catch is that these are DCHP-type connections. This will hinder proper configuration of Web page and email servers. If your budget convinces you to use this type of network solution, there are ways around this. You can use the service provided by Domain Host Service (`http://www.dhs.org`). This service uses client software, which is available at `http://members.home.com/verbatim/files/dhsdynup/liux/dhsdynup-2_9_1-src.tar.gz`.

The dhs.org system works with individual accounts. You must register and create an account, and you'll also need to install and configure the dhs client software. Now here's the magic: When you establish a connection with your provider, you are then assigned a dynamic IP address. This address will be recognized by the client and transmitted to the dhs.org server. The server will access your account information and will record the transmitted IP address and then reroute your Internet traffic to your <username>dhs.org address. This is a simple outline of how the service works. For details, go to the support page for Domain Host Service, listed previously.

Faxing with SuSE Linux 6.3

Another communication feature in SuSE Linux is its faxing programs. The distribution contains two different programs, sendfax and Hylafax. SuSE provides a graphical interface for Hylafax called SuSEFax. Figure 7.7 shows the SuSEFax interface.

The program offers a vast amount of flexibility. It comes with familiar options such as fax serving, job scheduling, adaptive answering support, and fax dispatching. It also includes a telephone book option to store all your recently called numbers. To access the phone book, type `susephone` at the command line.

The program has other features that make life easier as well, one of which is that SuSEFax will generate cover sheets for faxes automatically. Using this feature is convenient, but a word of caution: You will have to create a PostScript template for this option to work. Hylafax contains other tools to create cover sheets, such as latex-cover and faxcover—just type in the program name at the command line. For more details on

the using the fax programs see `/usr/doc/packages/hylafax/html/index.html`, or the Hylafax Web site at `http://www.hylafax.org/`. Presently, the SuSE database contains no information on problems associated with the fax programs.



Figure 7.7

Setting up the SuSEFax program.

Communication Features Summary

SuSE Linux offers you a broad range of connectivity options. Given the tools that are available with SuSE, you should have your network up and running in no time at all. From modem utilities such as minicom that can be custom-tailored for special connection requirements, to dial-on-demand ISDN systems, the software and setup resources are readily accessible from the CD-ROM. Because of the vast number of networking options in place today, I am sure that I've only scratched the surface. The online references provided in this chapter can prove invaluable, so use them liberally. For those who are choosing high-speed connections, I recommend getting a static IP address so that if you happen to set up an email server or any other service that requires constant and uninterrupted connectivity, you won't have to fiddle around with additional software applications.

Have fun, and enjoy talking to the world-at-large!

CHAPTER 8

Managing Users and Groups with YaST

YaST has proven itself a powerful tool to install software and perform configuration tasks on your SuSE Linux system. Now another unique element is about to become evident—its capability to manage users and groups on your Linux machine(s). If you are using your machine in a non-networked, isolated area that supports a single user and nothing else, then some of the information contained in this chapter is moot. However, if you plan to support users as a file server, or if you anticipate ssh- or ftp-type connections to your machine, read on.

System administration can be time consuming and tedious. The fact is that, without proper administration, your finely tuned SuSE Linux system can be wrought with chaos. With security concerns constantly arising in the news, monitoring your system is no longer a luxury, but a necessity. Although the focus of this book is directed toward installation, I would be remiss in my duty if I failed to shed more light on the subject of user administration. This is not to say that I will take for granted your prior knowledge of UNIX/Linux—instead, I will help clarify some of your standard parameters. This chapter briefly covers the user and group ID principles and the location of the related password files. It is important that you become familiar with the contents of these files as your user base grows.

Supporting multiple users in small or large environments is simple for your Linux system. The basic control factor is the kernel. The kernel sees the user(s) as numbers, and each user is identified by a specific integer called a user ID, or uid for short. It's easier for the kernel to read a number than a line of

plain text; this enhances the system performance by decreasing the amount of CPU processing overhead. A standard (text-type) username is also assigned to the uid and is kept in a database of system users located in the /etc/passwd file. For security purposes, the system also generates an encrypted text password and places it in the /etc/shadow file. The system also must assign a home directory and set up a working shell environment for the user, via the information in the file /etc/skel. Figure 8.1 shows the contents of the /etc/passwd file.

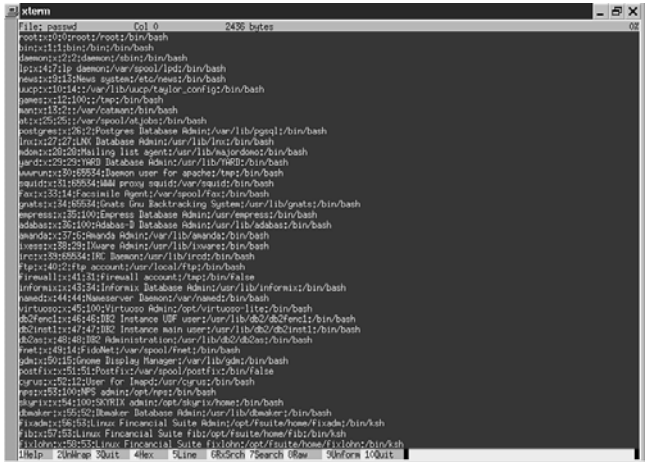


Figure 8.1

Unencrypted password file (/etc/passwd).

If you are not already acquainted with /etc/passwd, I'll break down the first line (username root):

```
root:x:0:0::/root:/bin/bash
```

The username is `root`, and `x` is a placeholder for the encrypted password contained in /etc/shadow. The first zero stands for the user ID, and the next zero represents the group to which root belongs. The `/root` indicates the home directory, and `/bin/bash` is the shell environment assigned to this user. As you can see, when the kernel is monitoring the root account, root is equivalent to 0 for user and group ID. Keep this in mind when setting up users—don't use random numbering, and establish a consistent pattern for user/group assignments. This can help eliminate security problems.

At one time, this was handled by individual commands invoked at the CLI. Commands such as `useradd` and `userdel` are still available from the CLI, but now YaST1 can handle these tasks.

Adding, Deleting, and Modifying User Accounts

To add or delete a user from the system with YaST, you will have to access the System Administration menu and choose User Administration.

These two function are assisted by the script /usr/sbin/useradd.local, which makes all the required entries to /etc/passwd and /etc/shadow, makes the home directory, and copies the files from /etc/skel. The script /usr/sbin/userdel.local deletes the entries from /etc/passwd and /etc/shadow, but leaves the /home/<username> directory.

Adding Users

Adding users is a simple task with the YaST1 utility. The entry screen for user administration is shown in Figure 8.2.



Figure 8.2

User Administration menu screen.

The User Administration menu gives you the ability to add new users to your system with ease. The input fields are set up in logical, concise order. The data entry is simple: You'll note that usernames are supported for up to 8 characters. When adding a new user, the user ID field has a default numbering feature. SuSE suggests using numbers above 500 for new users because the system reserves numbers below that for special purposes and processes that use pseudo-logins (such as nobody, master, and so on).

NOTE

Administrators of large systems should maintain a running log of users. This should be done by hand and verified by signature. This will help when and if it is necessary to perform a user audit. With this type of log, you can verify the add date and the administrator that performed the task. You also can scan the user database as a daily or weekly routine, checking for invalid usernames. Don't

continues

depend on the system files when it comes to the task of qualifying valid users—they can be compromised. A written log is harder to forge, especially if the system administrator makes every entry. It also goes with saying that this type of log must be kept secure and under lock and key.

The group ID or name can be input manually; if you are not sure which group to assign to the user, press the F3 key for a list of available options. If you make no changes, the system places the new user in the users group. Keep in mind that several groups already are listed on the system. It's a good idea to become familiar with the groups so that when there is change or an addition, you'll know which group listing to use.

The home directory field is also a default type input. Although you can change the information in this field, it is a good idea to let the system do the job. The home directory is listed by the username /home/<username>.

DISK USAGE

The use of /home directory space is something that you want to monitor closely. Users can consume a large home directory if they are working on big applications or adding software. If the /home directory is a single partition and you anticipate multiple users, then implementing disk usage quotas will help conserve disk space. A good disk quota resource is `http://homepage.cistron.nl/~mvw/quota.html`.

The field for login shell defaults to a bash shell, unless a different shell is requested. To access a list of available shell environments, press the F3 key.

The password entry is masked by asterisks. If the two entries do not match, you will be prompted to re-enter the password. You are limited to 8 characters in the password. As new users are added, you should make sure that they use good passwords. A mix of numbers and letters (uppercase and lowercase) will help prevent an easy system break-in.

The User Administration menu also enables you to give PPP dialup privileges to users at time of setup. You can do this by checking the box Access to Modem Permitted. As a side note, when you give this type of access to a user, that user will be added to the groups, uucp, and dialout.

The last available field is used for a detailed description of the user. If any comments can be made to distinguish the user from others, or vital personal information to list, this is the place for it. The F4 key creates the user account after all pertinent information has been input.

User Administration also enables you to prompt a user for a password change based on a prespecified date. In addition, you can warn the user of the password change date prior to the password expiration period. As an added feature, this menu enables you to lock out the user if the password has not been changed within a reasonable time frame. To use this feature, select an existing user and press the F6 key. Figure 8.3 shows the password maintenance menu.

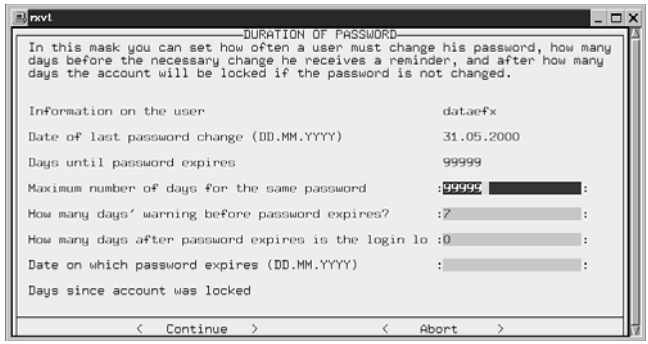


Figure 8.3

User administration password menu.

From this input menu, you can accomplish quite a few things. You also can add or modify the username if an existing user gets married or changes his name. This is beneficial and can save you a lot of time.

Deleting Users

The F5 key deletes the user account. This is performed by the script /usr/sbin/userdel.local, which deletes the entries from /etc/passwd and /etc/shadow, but leaves the /home/<username> directory.

A few words of caution: Before you delete the user account, it is better to disable the account. This will keep the person from using the account while the file maintenance is being performed (deletion of all account reference from the system). Disabling the account can help if the person has left suddenly and might return in the near future or is on a medical leave. To disable an account, you'll need to invoke your favorite editor and replace the user's password placeholder (`x`) with an asterisk (`*`).

NOTE

If the user that has left owning root, immediately change the root password, but do not disable the account, for obvious reasons.

If you are certain that the user will not return, delete the account and flush the system of all the user's files by searching the system with the `find` command, as follows:

```
# find / -user <username>
```

Depending on system size and user files generated, this could take a while. Running this during off-peak times will help speed up the process. After locating the files associated with the user, make sure that all are removed. This should include all mailboxes, mail aliases, print jobs, and `cron` or `at` jobs that still exist.

CLI Commands for User Accounts

Although YaST can perform many of the administrative tasks required by a system owner, there is no substitute for the command-line user management utilities. These can be used to change passwords and other vital user information quickly, and you will not have to invoke YaST or sort through a menu selection. I have mentioned the `useradd` and `userdel` commands previously, but I will list them again in this section.

- **`useradd`**—Adds a user and creates a work environment for the new user (bash shell)
- **`userdel`**—Deletes a user account, including the /etc/passwd and /etc/shadow files
- **`chfn`**—Changes the full name field
- **`chsh`**—Changes the login shell environment
- **`passwd`**—Changes the user password

Be mindful that normal users can use these commands to change the information content of their accounts. If this is a problem, you can limit non-root users by using the `chmod command.` Change all the commands so that root has access only.

If you find it necessary to change a username and you are unable to use YaST, type the command **`vipw`** to edit the /etc/passwd file. For editing groups, type the command **`vigr`** at the command line. If you are not familiar with the vi editor, use your favorite editor and load the password or group file by the full filename (/etc/<filename>).

Group Management

Using groups as a means to control files access has been in practice for quite a while in UNIX-type environments. Users must be assigned to at least one group, and that group might require that others in the same group have the ability to read or to read and write to the same file. It is prudent in a multiuser environment to allow specific access to specific people—this enhances security and system manageability. The groups are defined by their actual text name, and the group information is contained in the file /etc/group. Figure 8.4 shows an example of the group structure.

You will note that group information is straightforward: The group name is listed first; next is the password placeholder, represented by (x), the numerical group ID number (0); and last are the members of that group. The main concerns are the name of the group and the numerical classification that you or the system assigns to that group.

CAUTION

Do not delete or modify any group settings until you are familiar with group structures. The system creates groups such as root, wheel, tty, sys, and daemon for operational purposes, so it's not wise to change or add to this file prematurely. Establish your working groups, and then delete the unneeded ones accordingly.

When you name groups, do not use arbitrary names; keep the naming system conventional (standard) to help you and any other administrator figure out the group listings.

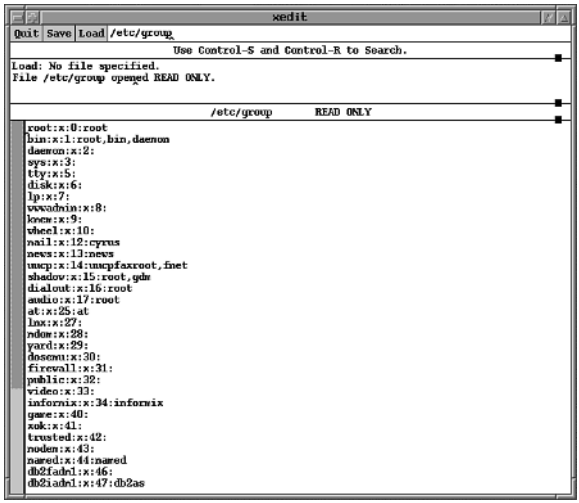


Figure 8.4

Contents of the /etc/group file.

If you are implementing Network Information System (NIS) on your SuSE machine, YaST currently cannot manage NIS users and groups. You'll need to manually edit the user/ group files with your favorite editor.

Using YaST to Configure System Security

Whenever more than one person uses a computer system, there is a potential for security breaches. Linux has received votes of confidence from most areas of computing, and this has fueled software acquiring and deployment of workstations and servers worldwide. Each time a new Linux installation is finished, of course, a number for problems exist. By default, the system initializes a number of services that may or may not need to be turned off. See Chapter 13, "Securing the Network," for details on nonessential services. Another problem is that user accounts for the nonessential service are also set up. Figure 8.5 shows the output of a security check program—it's a partial list of services and user accounts that the system automatically sets up according to the software you install.

Now multiply this by all the well-meaning individuals who are assigned the task of getting the new Linux-powered networks up and running. This has been taken lightly in the past, as if no one would take time out to compromise a home computer or a little-known Web site. The news headlines continue to prove that as a fallacy, though. Securely managing your user base is the main reason that I have addressed this situation—even if you are the sole user of the system, exercising caution when integrating your system into a network is key to survival. Consider the following analogy: If you were the captain of a ship and knew that you were about to enter a storm, would you leave your crew up on deck? I think not. Instead, you would give orders to lower the

sails and make sure that all the rigging was tied down. Above all, you would call the crew below deck and batten down the hatches. System administration works just like this—you must determine the network weather and conditions, and then take preventive measures.

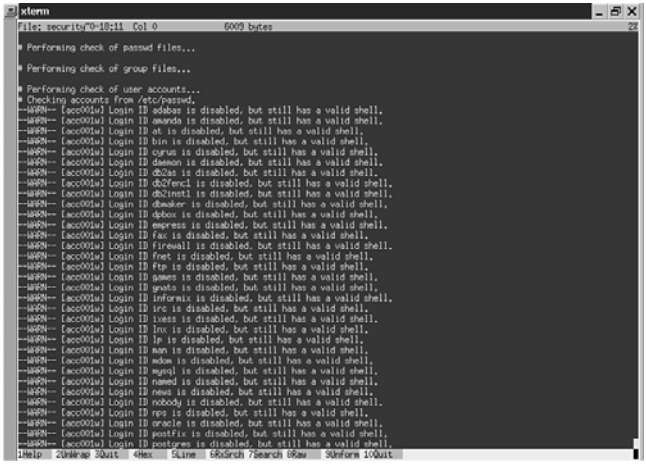


Figure 8.5

Default users generated by the system.

As a part of the System Administration menu, you will find a selection called Security Settings. This feature enables you to change some significant items. It essentially consists of two elements: General Information on System Security, and Configuration of /etc/login.def.

The Security Settings menu lets you change the system file permissions from secure to easy. You also can give telnet access to root, if required (this is not recommended, though; see `http://sdb.suse.de/sdb/en/html/perms.html` for details). A setting controls how the system responds to the Ctrl+Alt+Del keyboard signal (this is nice when you want to restrict this option from regular users). As noted on the menu warning, resetting (relaxing) system security can and will open loopholes for system intruders.

You also can use the Configuration of /etc/login.def selection to change the login features on a systemwide basis. The Configuration of /etc/login.def screen is shown in Figure 8.6.

From this menu, you can choose to record failed login attempts (recommended), record the number of seconds after a bad login attempt, and track successful logins. This file includes the minimum and maximum user and group numbers allowed by the system. This nice to have, in case you intend to tailor some of these parameters.

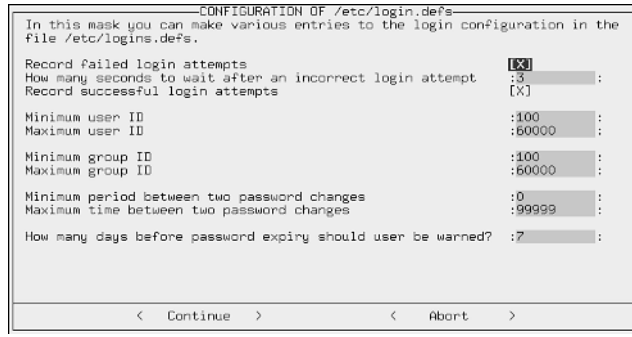


Figure 8.6

Configuration of /etc/login.def menu.

On a systemwide basis, you will be able to indicate the time factor between password changes. The password-warning field is similar to the one in User Administration, except that this affects global parameters.

Printer Configuration with YaST

One of the easiest tasks that I have encountered using YaST is printer configuration. You'll need to select System Administration menu and Integrate Hardware into System. Select Configure Printers to access the printer installation screen.

I have had the opportunity to use other printer configuration tools such as printtool, a GUI printer configurator, and magicfilterconfig, a console-based text-type printer configuration utility. Both are nice, but I really enjoy using apsfilter because of the number of print filters available. Figure 8.7 show the printer installation screen.

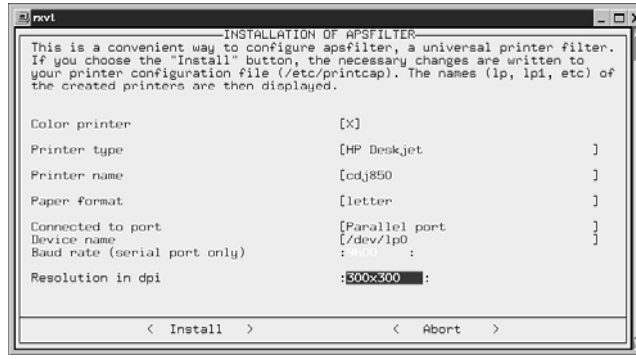


Figure 8.7

Printer installation screen.

The printing system on SuSE Linux is based on apsfilter and also contains some enhancements, SuSE's apsfilter recognizes all common file formats, including regular HTML file formats, if the package html2ps is installed. YaST enables you to configure PostScript, DeskJet, and other printers supported by Ghostscript drivers; it's also possible to set up HP's GDI printers, which include the HP DeskJet 710/720, 820, and 1000 printers. This can be done by using the ppa package, which currently supports black-and-white printing only. YaST produces /etc/printcap entries for every printer (raw, ascii, auto, and color, if the printer to configure is a color printer). YaST generates the appropriate spool directories and arranges the apsfilterrc file. From this file, you can fine-tune settings such as Ghostscript preloads, paper size, paper orientation, resolution, and printer escape sequences. A printer checklist also is available on the SuSE database at `http://sdb.suse.de/sdb/en/html/drucker-howto.html`. If you run into configuration problems, check this URL for more help.

As an option to using YaST for printer configuration (just in case you cannot access YaST), you can use the apsfilter setup tool by typing **`lprsetup`** at the command line. This invokes the setup tool that is built into the apsfilter program. This setup tool gives you a nice user interface, as shown in Figure 8.8.

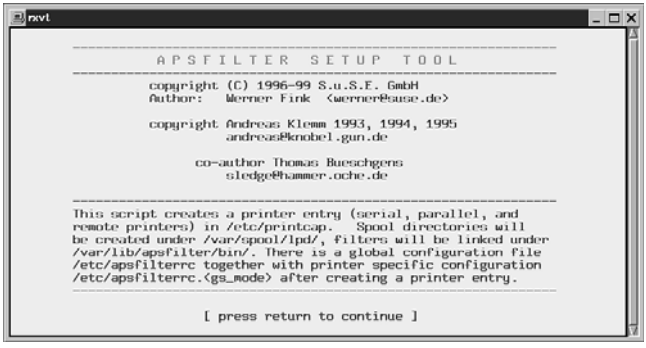


Figure 8.8

The APSFilter setup tool `lprsetup`.

Currently YaST printer configuration doesn't feature color laser printers. If you configure a mono printer, you'll need to edit the /etc/printcap file. It's necessary to change mono to color everywhere in the printcap entry. If you have problems printing after making these modifications, you also might have to rename the spool directory.

Configuring Remote Printers with YaST

The line printer daemon (spool area handler) lpd is normally invoked at boot time. When started, it attempts to query the parameters (settings) in the printcap file to find information on the current printers; it then prints any files left in the spool. This is helpful if the printer was accidentally turned off, or if an unexpected system shutdown

occurs. Then lpd uses two system calls, listen and accept, to receive requests to print files in the queue, to transfer files to the spooling area, to display the print queue, or to remove jobs from the queue. In these cases, lpd forwards the job to a child process to handle the request so that the parent process can continue to listen for more requests.

One of the features of lpd is that it supports printing over the network to printers that are physically connected to a different machine. With the careful configuration of filter script(s), plus a few other utilities such as Samba, you can send print jobs transparently to printers on all sorts of networks.

Another component in the printing process is lpr, whose function is to control the printer spool based on individual users. It contacts lpd and injects a new print job into the spool. As you can see, printing take a few steps to complete.

You'll find that with YaST, it's also possible to set up different types of network printers. Some of the supported types of network connections are TCP/IP, Samba, or Novell NetWare protocols. Your SuSE Linux machine can be used for a number of different applications; print serving is just one of them. Due to the variety of network environments, I can direct you to only some resources that I know will help you. One is the current Printing HOWTO, located at `http://www.linuxdoc.org/HOWTO/Printing-HOWTO.html#toc10`. The SuSE database also is an excellent resource at `http://sdb.suse.de/sdb/en/html/cep_basic_network.html`, as is `http://linux.integrity.hu/support-db/sdb_e/kgw_print_remote.html`.



TIP

For networked printers that must be fed from Ghostscript, you'll need to first uncomment the line `REMOTE_PRINTER="remote"` in /etc/apsfilterrc to get the printer to respond. Then invoke YaST and select System Administration. Select Integrate Hardware into System, and choose Configure Printers. Then configure the base printer settings as required. You'll also need to set up the remote printer queue under the Network Configurations selection.

YaST has a menu selection called Administer Remote Printers, which enables you to configure printers that are connected by the TCP/IP protocol. The configuration includes information on the name of the printer, the spool directory, and the server name. The name of the printer is the name by which the local machine calls the printer (for example, remote). The spool directory is configured automatically with the name input in the appropriate field. The server name is the network IP address or the name of the print server. The printer entry is contained in the /etc/printcap file.

You also can configure printers on a network supported by Samba, with the package samba. This connects a printer on a Windows-based network.

Other options also exist, such as connecting printers on a Novell network and configuring printers on an ISDN network. The software packages must be installed to support each of these protocols.

User Management Summary

This chapter has helped you become acquainted with YaST's capability to easily add, change, and modify users. Also included in this chapter is the CLI command for user management. These commands will help you make quick adjustments without YaST. Hopefully the task of managing groups and tightening system security has been made simpler with the overview of these subjects—when supporting more than one user, this issue should be paramount in system administration. YaST's versatility provides few different ways of handling printers, whether for local printing, remote access, or supporting printers in a non-Linux environment. Even if you are not a system administrator, the features in YaST are bound to help you get the task done—and done right.

CHAPTER 9

Tailoring a Custom Kernel

In the last year or so, Linux in general has made leaps and bounds that have resulted in new kernel versions that support more hardware than ever. SuSE has made available a number of precompiled kernels, on which the average system can run with no problem. Yet the fact still remains that Linux does not support all hardware components at this time. For example, the network card(s) in your machine are Tulip chip type. Even though the driver might support the Tulip chip family, driver version might not contain updated code, which will enable the card to work properly. You're now faced with the proposition of 1) finding the correct Tulip driver and compiling it individually, or 2) completely recompiling the kernel as a whole. Either way, there is work ahead.

If you are setting up this SuSE machine for noncommercial use or as an evaluation platform, recompiling the kernel might be impractical. A test machine will rarely need to be fine-tuned to gauge the machine's overall performance—unless that's the way you like it. If so, you might want to move on to the next chapter. Then again, if you plan to use it as a network firewall, an IP-Masquerading box, or some other exotic application, this chapter is for you.

This chapter is not designed to minimize the complexity of the process, nor to make light of the possible consequences of a failed compile. My hope is to give you some tangible information to guide you through the tailoring process, if necessary.

The generic kernel, which is built and included in SuSE, is designed to boot up and recognize a broad range of hardware and peripherals. To accomplish this, features for different types of machines are taken into account and then assessed based on a percentage of overall use. From the standpoint of distribution

companies, this is a plus: The more machines the operating system will work on, the more customers will buy it. Figure 9.1 offers an illustration of kernel image size—take a look at vmlinuz and vmlinuz1.

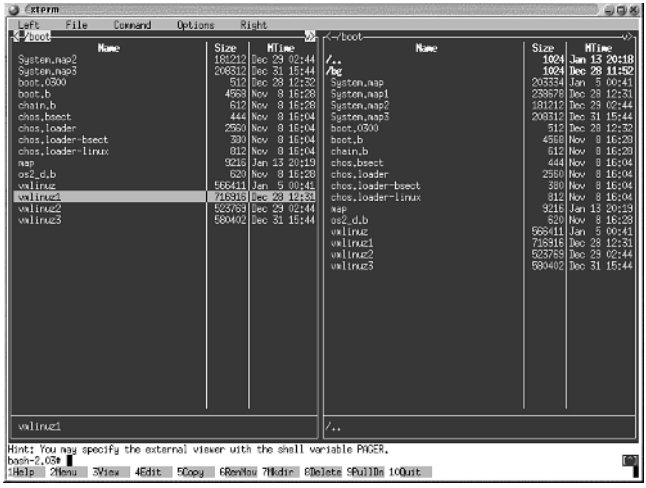


Figure 9.1

Kernel image size comparison—vmlinuz versus vmlinuz1.

A 150KB difference between the generic kernel vmlinuz1 and the recompiled kernel vmlinuz shows you how much additional code is contained in the generic kernel. When booting SuSE Linux, the time involved is not unusually long, but it does take a while. Unnecessarily probing hardware and loading unused drivers and modules also can lengthen startup time. Reducing the contents of the kernel by running only the required components helps free up memory and use system resources more efficiently.

The Linux kernel acts like an interface between your hardware and your program applications. It also performs memory management functions. Like a circus ringmaster, it is responsible for balancing the system resources and making sure that all processes get their share of CPU time.

Some of the kernel's primary functions are

- Manages resources for running processes
- Creates and destroys (kills) processes
- Executes programs
- Provides access to filesystems

One benefit of running the Linux operating system is its capability to interface with different data structures by using the virtual filesystem (VFS). The VFS supplies a

layer by which the information passes between the kernel and filesystem modules. The versatility of the VFS is uncanny: It can support standard UNIX type filesystems as well as MS-DOS, UM-DOS, and vfat files, among others.

Although these filesystem principles might seem rudimentary, they will give you an idea of why you might want to customize your kernel.

The device drivers contained in the kernel recognize the device, access a portion of memory, and provide code to see that it operates correctly.

The kernel supports networking protocols such as TCP/IP, UDP, and PPP protocols, to name a few. This allows Linux to effectively talk with different types of operating systems. Advanced networking features in the kernel include NFS and Network Address Translation (NAT) (IP Masquerading).

Compiling a custom kernel will produce a kernel that will contain only the drivers and services that are required by a specific machine. If you like, you can build the kernel with all the required device drivers loaded. This is called a *monolithic* kernel. To lighten the load during startup, you can build the drivers as modules. This *modularized* kernel will autoload the specific drivers, if necessary. This concept improves the overall performance and flexibility of the system. If a piece of hardware is removed, it will not be recognized during startup and thus will not be loaded.

If network security is a concern, you should ensure that drivers and services that are not used are shut down or eliminated. Granted, not a lot of vulnerability problems at the kernel level pose a security risk, but some risky situations could arise. For details on this subject, point your browser to `http://linuxtoday.com/stories/14671.html`.

The Benefits of Building Your Own Kernel

What are the benefits of building your own kernel? As an example, let's use your automobile in an analogy. If the outside temperature were 25° F, would you run the air conditioning all the time? Probably not—it would be a waste of energy resources, and it possibly would make you a bit uncomfortable. The engine (or, in our case, the operating system) is the power plant, and the air conditioning (the device drivers) is the accessory component. You do not want to remove the air conditioning unit from the car permanently, just deactivate the component while it's not needed. Turning off unused accessories can help improve gas mileage and improve overall performance.

One of my first tasks after installing a Linux system is to download the latest stable kernel source and start from scratch. Taking this type of approach enables you to harness the power of SuSE Linux and delegate the use of resources from the start. If you administer a multi-user system, customizing the kernel should take priority. Consider this: When the system is up and running, interrupting user(s) activities will be costly, and your desire to change features will be outweighed with its daily use. If you are planning to recompile the kernel, factor in an hour or so (maybe two, if this is your first time) into your setup schedule.

The simplicity of building a new kernel is refreshing. You can choose to use the basic text-based configuration utility or the menu type configuration tool. An X Window system interface is quite easy to use, if that's your preference.

The main reason I have become familiar with the issue of compiling kernels is based on need. I needed to get a piece of hardware running on my Linux system, so I was faced with the proposition of keeping a useless piece of hardware or taking on the challenge of customizing my kernel. I have found over the course of time, that this step has helped me more than I could have imagined. I have been able to get systems up and running in situations when, if I had lacked the ability, I might have erroneously thought that Linux was not as capable or flexible as the other operating systems. My laptop runs the development kernel 2.3.34, which gives me sound capabilities (sometimes a surprise to other laptop users) that have yet to be incorporated into the stable kernel tree. So, getting acquainted with the process will only enhance your future installs.

WARNING

Remember, the stable kernel version is 2.2. I do not recommend experimenting with the development kernel because these can be quite unstable. Development kernels are not guaranteed to successfully compile or to perform with your current hardware configuration.

I have noticed on mailing lists the increased interest in kernel compiling, and I don't believe this is coincidence. Where else can you get a router, firewall, workstation, or computer that has dial-up capabilities in one box? You can connect multiple machines to the Internet from one dial-up account and then enable simple firewall rules to protect your LAN from intruders. The items that other operating system charge for are built right into the Linux kernel.

There are plenty of other reasons to "roll your own" kernel, but those should be good for starters—the complete list would take up a whole page or two.

Performing the Building Process

Whether you decide to include or exclude components in customizing your kernel, you will have to be careful to read all the kernel options before you start. I recommend accessing the Kernel-HOWTO for details, including questions you have that are not addressed in this text. You can find this HOWTO at `/usr/doc/howto/en/html/Kernel-HOWTO-2.html`.

It is not feasible to cover every step of the kernel build process because there are factors that only you can qualify or determine. Building the kernel should not be a rushed process. A general overview of commands which are used in the building process are outlined in the section "Tailoring the Kernel Components."

NOTE

If you are wondering whether you have the correct compiler installed for the kernel you intend to build, take a look at the README contained in the kernel source. It will specify what type of compiler is required.

Latest Kernel Source

The need for support drives kernel development. Before recompiling, be sure to verify that you are using the latest stable version available. This will ensure that you're equipped with current drivers and options that can make you SuSE Linux system more usable. To find the latest source, point you browser to `http://www.kernel.org/pub/linux/kernel/v2.2`.

The source files can be obtained in two compression formats: linux-2.2.xx.tar.gz or linux-2.2.xx.tar.bz2. The bz2 format files are smaller in size due to the tighter compression method. A fully decompressed kernel in either format will take up about 68MB of space; make sure that you have enough room in /usr/src. Your next step will require you to switch to your super-user account, or log out and then log on as root. Now you can download the source; if you use ftp, I recommend using the ftp site `ftp:zeus.kernel.org`.

Download the source into the /usr/src directory. The current source directory should be linux-2.2.13.SuSE, and it can be left alone for now. There are several ways to decompress files—I'll show my favorites methods. Issue the following command(s), (depending on the compression format) at the CLI.

```
gzip -dc linux-2.2.xx.tar.gz | tar -xvf-
bunzip2 -cd linux-2.2.xx.tar.bz2 | tar -xvf-
```

Now you have a new linux directory set up and ready for action.

WARNING

Do not remove (delete) the present kernel image and System.map file from the /boot directory. If necessary, rename the files with the .old suffix. If you delete these files and the new kernel fails to compile, you might have a problem getting everything running again.

Applying Kernel Patches

You may opt to forego the complete source download and obtain the patch that will upgrade your current kernel. Patches can be found in the same directory as the source files, listed as patch-2.2.xx. with the bz2 or gz suffix. Download your patch into the /usr/src directory. If the patch is generic (no ac1 or pre-patch series), the filename must be "linux"; rename the file accordingly. To rename the file issue the following at the command line:

```
mv linux-2.2.13.SuSE linux
```

You will need to clean up your kernel tree and old config files so that nothing conflicts. Issue this command in the /usr/src/linux directory:

```
make mrproper
```

This will do a thorough cleaning of leftover config and object files. Now go back to the directory that contains the patch and issue this command to patch the kernel source:

```
gzip -dc patch-2.2.xx.gz | patch -p0
```

If you are patching with an ac or pre-patch, you will need to rename the linux directory. Some pre-patches will not install unless the renamed directory looks like this:

```
/usr/src/linux.14p9
```

This would patch version 2.2.13 with pre-patch-2.2.14-9.gz. So, if your patch fails, look at the debug comments at the beginning of the process. These comments will indicate which directory the patch file is looking to patch. Rename the linux directory accordingly, and then patching is done.

Tailoring the Kernel Components

To get the process started, you will have to become familiar with a few `make` commands:

- **`make config`**—When invoked, this `make` command uses a text-based interface and allows kernel option selections.
- **`make menuconfig`**—This command works the same as the `make config` command, except that the interface is a menu-type, semigraphical interface. (See Figure 9.2.)

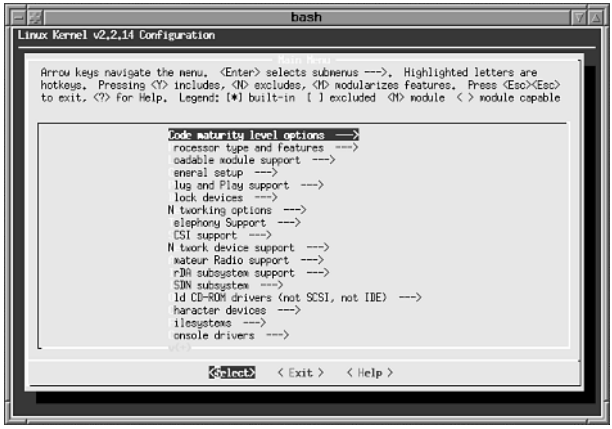


Figure 9.2

Menuconfig Selection Screen.

- **`make xconfig`**—Displays a kernel options selection interface based on the X Window system. (See Figure 9.3.)

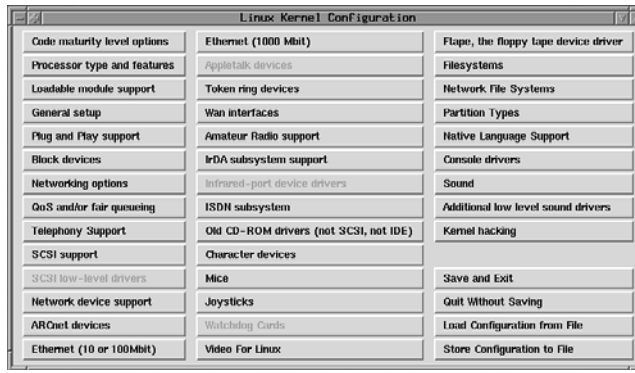


Figure 9.3

X Window Based Kernel Configuration Screen (xconfig).

As with patching, I recommend using `make mrproper` before commencing the build. Try to make sure that everything is in order and cleaned up.

Although `make menuconfig` is the favorite interface, `make xconfig` is a better choice for first-timers. The main reason is that `make menuconfig` format has subselections that can easily be missed and that can result in bad compiling.

When you are making your selections, keep in mind that what you choose is what you get. You might find a lot of neat drivers in the selection, but you should choose only the ones that are applicable to your present needs. Also, selecting a driver and inserting it into the running kernel will increase the overall size of the kernel—choosing modules is always a better method.

You will have to apply some basics with any kernel rebuild. These are enumerated in Table 9.1.

Table 9.1 Linux Kernel Configuration

Category	Selection Items Not to Miss
Processor type and features	Correct processor family
Networking options	TCP syncookie support; firewalling options, if required
Network device support	Point-to-Point support for dial-up machines
Ethernet (10Mb or 100Mb)	Correct driver for NIC
Joysticks	Correct driver for joystick (gamers like this)
Ftape	Correct driver for tape drive
Sound	Applicable OSS driver, if SuSE ALSA modules do not work for you
Kernel hacking	No need to change

Choose Save and Exit to save your current selections.

Issue the command `make dep` to ensure that all dependencies have been met—this should run pretty quickly.

The next commands can be issued as a set, which will allow you to get up and stretch and grab a cup of coffee. If you prefer, however, you can issue them one at a time. I will list them individually for now:

- **`make bzImage`**—Compiles the kernel image file `bzImage`
- **`make modules`**—Creates device driver modules
- **`make modules_install`**—Installs modules in /lib/modules
- **`depmod -a`**—Searches for modules in all directories specified in the configuration file /etc/modules.conf.

The optional command set to automate this procedure is as follows:

```
make bzImage modules modules_install
```

The `make` command will perform each of the listed commands in succession. If you have a Pentium processor machine, this process will take approximately one hour or less.



TIP

To take full advantage of the optional command set, include the command `make bzlilo`. This will convert the bzImage, which the compiler made, to vmlinuz. The System.map file and vmlinuz will be copied to the / (root) directory, and this command also will run LILO automatically. You will need to link /boot/vmlinuz and /boot/System.map to the root directory for this to work. (See Figure 9.4.)

You'll now need to copy the System.map file from /usr/src/linux and the bzImage file from /usr/src/linux/arch/i386/boot. The `make bzlilo` command offers a better way of handling things. You can choose not to link the / and /boot directory, and then you can manually copy the files to /boot.

As a friendly reminder, always run the `lilo` command after installing a new kernel. This remaps /etc/lilo.config, adding any changes necessary.



WARNING

Though not as popular as in the past, there may be a few users that have over-clocked processor systems. You should not compile a kernel on an over-clocked system. It will create bugs in the kernel and possibly cause your system to crash. Compile the kernel while running the processor at normal speed, install the new kernel and then over-clock the system.

If you use a laptop, you will have a bit more work in front of you. The stable kernel does not come with PCMCIA support included, so you will have to grab the current source package at `ftp://sourceforge.org/pcmcia`.

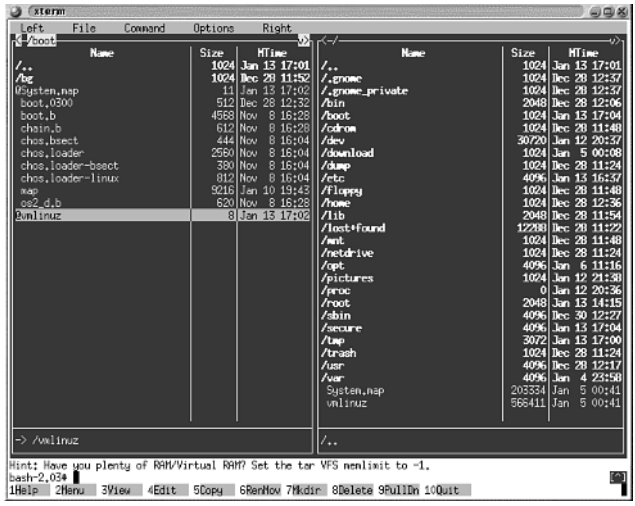


Figure 9.4

Symlinking vmlinuz and System.map files to /root Directory.

You'll need to unpack the source pcmcia-cs-3.x.x.tar.gz in the /usr/src directory. Move to the new pcmcia directory, and run `make config`. This performs a system check and gives you some options to choose from.

After finishing the configuration run `make all` and then `make install`. To wrap up, check your options setting in /etc/pcmcia to ensure that all is well.

For more help on PCMCIA module setup, see the current PCMCIA-HOWTO, located at `http://pcmcia.sourceforge.org/ftp/doc/PCMCIA-HOWTO.html`.

Custom Kernel Summary

If you are reading this, either you have jumped ahead to see what the end of the chapter is like, or you've finished your custom built kernel. Now you are the master of your system domain, and hopefully it was not nearly the onerous task that you had conjured up in your mind. You've performed all the `make` commands and succeeded in using the `bzlilo` command. Using `depmod` and `lilo` is a snap, and the results will be worth your effort. Heed the warnings, however: Do not remove (delete) the previous kernel image until you are sure that your new kernel image operates properly.

CHAPTER 10

Managing the Network Setup

Network management can be relatively easy or extremely difficult, depending on the size and composition of the network. Management duties can range from a simple backup to integrating different types of operating systems into a common environment. The Linux platform lends its flexibility to numerous applications, blending into a Windows-type network as a Samba server, or handling routing and masquerading/firewalling assignments with ease.

With the help of SuSE's YaST1, the management routine will not become burdensome. Whether you have 1 machine or 100 machines, YaST1 will help you keep the network in order.

We will examine some of the outstanding network management tools that are built into YaST1. You will get a feel of how to control the system, and you will use some of the network monitoring tools that come with SuSE Linux 6.3. First, let's look at system configuration.

NETWORK MAINTENANCE

Starting, stopping and adding services on the network can be a challenge. If you are the sole user of the network, the task is easier—you will not have the tendency to interrupt your own work without keeping in mind your network management duties and the resulting loss of time.

The case is much different with a multiuser environment—taking the network down in the middle of the day is not a good idea. Schedule this type of activity either at the beginning of the day, when no users are present, or at the end of the day, when the majority of your users are finishing up their work.

Configuring the System with YaST1

In any network environment, the ability to change parameters and add or delete services has its advantages. SuSE Linux is far above the rest in simplifying system configuration. System configuration is usually done by editing the files with your favorite editor, vi or nedit. This method requires you to have a firm grasp on a few things: the location(s) of the file to be changed, and the specific change that is necessary. Another factor involves whether you intend to enable a service by removing the comment (deleting the comment [#] in front of the related line). Still other examples include adding a parameter to a line (inserting information into an empty field, such as IPADDR="", inserting the information in the quotes, for example IPADDR="197.113.107.1").

As you know, there is no set standard for system and network configurations. Given the fact that different distributions have different file locations and formats, the task can become daunting. SuSE has developed a simple, straightforward file configuration interface. The ASCII type interface brings together a majority of the most commonly modified files and gives you information on specific change options. The Configuration File tool is not a cure-all, though. Sometimes a file or files that you need to edit are not included in the configuration menu; in this case, you would have to change the file by using the standard editing method. This can happen in the configuration of the /etc/pcmcia/network.opts file or the /etc/rc.config.d/firewall.rc.config script.

The Configuration File menu of System Administration has more than 200 individual parameter fields that allow changes to the system or the network operations. Figure 10.1 shows the YaST1 menu selection to reach the configuration files.



Figure 10.1

Selecting YaST1 Change configuration file option.

System Configuration is presented as a scroll-down type menu with individual explanations (if available) of the highlighted service or parameter field(s).

NOTE

Due to the high number of selections available in System Configuration, it would be impractical to cover them all. We'll focus on the most commonly used service and parameter settings. This will help you control your network and system environment.

Network and System Configuration

SuSE Linux has gathered the following list of service and configuration parameters into one utility, which does everything from choosing your display manager to disabling SuSEconfig. The items are listed in descending order as they are found on the menu.

WARNING

The SuSEconfig utility performs the changes to the system. If you turn off SuSEconfig for any reason, the Configuration utility will become useless.

I've put together a table that can be consulted when a system change is required. While the same list can be found in the YaST1 utility, you may have to search through more than 200 selections to find what you need. Table 11.1 is condensed to help identify the services that you'll use most often. The first column indicates the SuSEconfig function. In the second column, "yes" or "no" indicates services turned on or off, whereas "open" means that you will have to supply the correct parameter. The term "automatic" is given to items the system configures itself. The last column lists specific comments on what the service or parameter affects.

Table 10.1 YaST1 System Configuration List

System Function	Option	Comment
BEAUTIFY_ETC_HOSTS	yes/no	Sorts /etc/hosts file.
CHECK_ETC_HOSTS	yes/no	Checks and or modifies /etc/hosts file.
CHECK_INITTAB	yes/no	Checks and or modifies /etc/inttab file.
CHECK_PERMISSIONS	set/warn	Corrects or warns of failed permissions in /etc/permissions.
CONSOLE_SHUTDOWN	ignore/reboot/halt	Choose system-wide use of Crtl+Alt+Del key function.
CREATE_HOSTCONF	yes/no	Generates/checks /etc/host.conf file.

continues

Table 10.1 continued

System Function	Option	Comment
CREATE_RESOLVCONF	yes/no	Configures and maintains the /etc/resolv.conf file.
CRON	yes/no	Starts the cron daemon.
DEFAULT_WM	KDE,WM,Enlightenment	Selects your startup window manager.
DHCLIENT	yes/no	Starts the DHCP client.
DHCLIENT_SLEEP	open	Gives DHCP initialization time in seconds.
DISPLAYMANAGER	console/kdm/xdm	Activates the display manager at boot time.
ENABLE_SUSECONFIG	yes/no	Enables automatic system configurations.
FQHOSTNAME	current hostname	Is the name that you have chosen for your computer, such as my.computer.com.
FTP_PROXY	open	Indicates ftp proxy address.
GMT	–u, ""	Use –u if clock is set to GMT, use empty quotes ("") for local.
GPM_PARAM	open	Enables you to modify mouse parameters.
IFCONFIG_0	open	Gives the primary IP, broadcast, and netmask addresses, as seen in the ifconfig output.
IFCONFIG_1	open	Gives the secondary IP, broadcast, and netmask addresses, as seen in the ifconfig output.
IPADDR_0	open	Gives the primary IP address.

System Function	Option	Comment
IPPADDR_1	open	Gives the secondary IP address.
IP_DYNIP	yes/no	Enables the dynamic IP patch feature during bootup.
IP_FORWARD	yes/no	Forwards IP packets, and handles masquerading and routing.
IP_TCP_SYNCOOKIES	yes/no	Provides syn-flood packet protection.
IRCSERVER	open	Enables you to add your favorite irc server address here.
KBD_CAPSLOCK	yes/no	Asks whether the keyboard CapsLock is on.
KBD_NUMLOCK	yes/no	Asks whether the keyboard NumLock is on.
KBD_RATE	open	Gives the repeat rate; must input delay time (ms) for this option to work.
KDB_TTY	open	Specifies ttys that can use NumLock and CapsLock (tty1 tty2 or "" for all ttys).
KDM_GREETSTRING	open	Used to display the hostname for the computer on the display manager screen.
KDM_SHUTDOWN	root, all, none, local	Shows users that can shut down the system in the KDM display manager screen.
KDM_USERS	open	Modifies the list of users on the KDM main screen.
KEYTABLE	<table type>	Enables you to specify the keyboard table type (as in <us.map.gz>).

continues

Table 10.1 continued

System Function	Option	Comment
LANGUAGE	open	Enables you to specify a native language.
MAIL_LEVEL	warn/all	Warn gives important messages; all gives mail and logs.
MAIL_REPORTS_TO	open	Mails configuration changes to root or any user of choice.
MAX_DAYS_FOR_LOG_FILES	open	Tells how long log files will be stored.
MAX_RPMDB_BACKUPS	open	Specifies the maximum number of backup files for the rpm database.
MODEM	open	Identifies the device used as a modem (<TtySx>).
MOUSE	open	Indicates which device is the mouse (<TtySz>).
NAMESERVER	open	Gives the IP address of your DNS nameserver.
NETCONFIG	open	Specifies the devices (NIC) used as network interfaces.
NETDEV_0	automatic	Indicates the first network device eth0.
NETDEV_1	automatic	Indicates the second network device eth1.
NFS_SERVER	yes/no	Starts up the NFS server.
NNTPSERVER	yes/no	Gives the address of the news server.
PASSWD_USE_CRACKLIB	yes/no	Enables you to use cracklib to check new passwords.
PATH	<PATH>	This PATH is set for SuSEconfig and cron. *Do not change this setting.*
PCMCIA	i82365 or tcic	Indicates the PCMCIA chipset used.

System Function	Option	Comment
PCMCIA_CORE_OPTS	open	Refer to man pages, `#man pcmcia-core` for options.
PCMCIA_PCIC_OPTS	open	Determines socket driver timing; see `#man i82365` or `#man tcic` for details.
PERMISSION_SECURITY	easy, secure, paranoid	Sets file permissions system-wide.
POSTFIX_CREATECF	yes/no	Determines whether the Postfix configuration file be will be created by the system.
POSTFIX_LOCALDOMAINS	open	Gives the localhost and system domain name.
POSTFIX_MAILDROP_MODE	nosgid/sgid	Is the protected mail drop directory or writeable directory; refer to /usr/doc/packages/postfix/Install section 12.
POSTFIX_MASQUERADE_DOMAIN	open	Lists internal domains that require the subdomain structure stripped off.
POSTFIX_RELAYHOST	open	Indicate mail relay, if required.
ROOT_LOGIN_REMOTE	yes/no	Determines whether root will be allowed to log in from another machine.
RUN_UPDATEDB_AS	nobody/root	Indicates which user will run the update.
SEARCHLIST	domain name	Specifies domains used in /etc/resolv.conf.
SMTP	yes/no	Starts the mail daemon.
SORT_PASSWD_BY_UID	yes/no	System will sort users and groups by ID.
START_ATD	yes/no	Starts the at daemon.

continues

Table 10.1 continued

System Function	Option	Comment
START_AUTOFS	yes/no	Starts the auto mount daemon.
START_FW	yes/no	Starts the firewall script at boot time.
START_GPM	yes/no	Starts the mouse daemon.
START_HTTPD	yes/no	Starts the Apache or Roxen Web server.
START_IDENTD	yes/no	Starts the system identity daemon in multiuser mode.
START_INETD	yes/no	Starts the network daemon.
START_ISAPNP	yes/no	Initializes plug-and-play support.
START_KERNELD	yes/no	Starts the kernel daemon.
START_LOOPBACK	yes/no	Uses loopback networking.
START_LPD	yes/no	Starts the printer daemon.
START_NAMED	yes/no	Starts the name daemon for BIND.
START_PCMCIA	yes/no	Starts PCMCIA at boot time.
START_PORTMAP	yes/no	Starts portmappper.
START_POSTFIX	yes/no	Starts the postfix mail server.
START_SENDMAIL	yes/no	Start the sendmail mail server.
START_ROUTED	yes/no	Starts the route daemon for dynamic routing.
START_SCANLOGD	yes/no	Starts the port scan log daemon.
START_USB	yes/no	Initializes USB support.
START_XNTPD	yes/no	Start the time server daemon at bootup.
SUSEWM_UPDATE	yes/no	Creates system-wide configuration files for the installed window managers.

System Function	Option	Comment
SUSEWM_XPM	yes/no	Installs small or large pixmaps for the window manager.
TIMEZONE	open	Modifies the /usr/lib/zoneinfo/localtime file.
USB_DRIVERS	usb-keyboard-mouse, other USB devices	Enables you to specify additional USB devices here.
USE_NIS_FOR_AUTOFS	yes/no	Uses NIS for autofs services.
XNTPD_INITIAL_NTPDATE	open	Lists time server IP addresses.

As you can see by the preceding table, the capability to control the network environment, window managers, and device configuration is at your fingertips in one easy scroll-down menu. Starting and stopping your mail server is a breeze; controlling keyboard input for shutdown is a snap. You don't have to chase all over the system to find the correct configuration file to edit. Choosing to use this utility will definitely impact your overall use of the Linux platform.

SuSE's system configuration menu does not try to perform all the tasks noninteractively. You will have to learn some of the inner workings of the system. Still, I have found no better system configuration tutor in current distributions. In certain cases (using the F2 Show Info key), the comments will provide semidetailed instructions on service and parameters. The Show Info selection is not available on every items; when possible, it will direct you to a more detailed source of information.

Now that you the "how" and "where" of system configuration, we will need to look at the "what." What services will you run, and what features will you offer your users? Let's move on to take an overall look at the "what" in network services.

Configuring Internet Services

When configuring Internet services, the question is what services and functions you will run on your machine. For instance, your standalone machine is connected for a short time during the day, so there is no reason to use anything other than a modem and then configure the browser. Some people may have considered building a home network, and if so, you would need more than one machine connected to a single connection. Let's start with addressing the Web browser configuration.

Web Browser Configuration

A significant amount of time has passed since Linux has assumed center stage in the Internet drama. The increasing use of the Internet requires more advanced technology than was available when Linux was created. SuSE Linux offers two choices in Web browsers: Lynx and the Netscape Communicator. Let's take a look at their features.

Lynx Web Browser

On the average, most Linux distributions include several Web browsers in their packaged offerings. SuSE is no different; one of the favorite browsers of veteran Linux users is named Lynx. This browser is a text-based browser, which may appeal to the hard-core Linux user. The speed of this browser is phenomenal because it does not have to resolve graphical images. Although it's a text-type browser, it has configuration features that other Web browsers don't. The following list shows some of the options for Lynx.

By pressing the O key, you can access the Lynx Options menu.

E—Show selected editor
D—Show the display variable
B—Access the bookmark file
F—Indicate ftp sort criteria
P—Input personal mail addresses
S—Select searching type
C—Choose character set
V—Show vi keys
*e—Show emacs keys
K—Use keypad as arrows
U—Access user mode
L—Show local execution links

When you type **`lynx`** at the command line, you access the Lynx Help screen menu. Figure 10.2 shows the Lynx Help page.

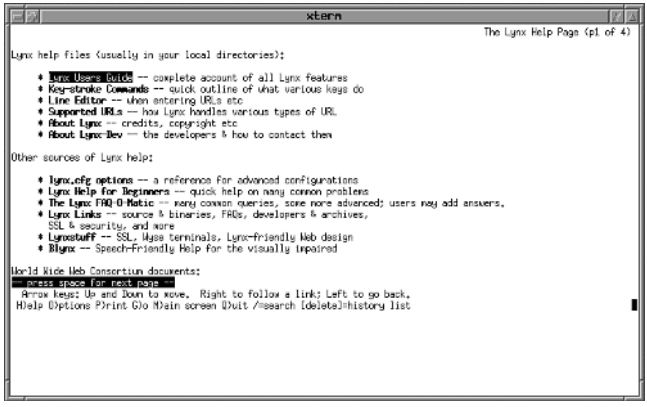


Figure 10.2

Getting help from Lynx.

Once configured, Lynx proves to be a strong Web browser application. For anyone who is concerned with text applications and reading documents online, Lynx is the ideal browser. Lynx supports some of the latest HTML technology (except on graphical images), and you will have no trouble using the links provided on current Web pages. If you have a machine that is older, or that has less than 24–32MB of RAM, this browser will make life bearable. The loading time for HTML pages is decreased because Lynx looks at the text only.

The University of Kansas is the best source of information available on new releases and user information. Its Web site is located at `http://www.cc.ukans.edu/lynx_help/Lynx_users_guide.html`. The current version of Lynx is 2.8.2

One other site may prove useful in getting acquainted with Lynx. This site provides additional insight on quick configurations of Lynx: `http://reality.sgi.com/raju/lynx.txt`.

Netscape Web Browser

The Netscape Web browser has been an integrated part of the Linux explosion because of its portability and cost (none). Netscape fits right in with the rest of the software included in this distribution.

Netscape is a fully configurable Web browser with a built-in mailer that supports POP, IMAP, and Movemail protocols. You can set up Netscape so that you can receive your postings from newsgroups. You also can use several other features to ease your daily Internet tasks.

If you start Netscape and find that it seems to hang for a long time and then gives the errors seen in Figure 10.3, you may have a network connection problem.

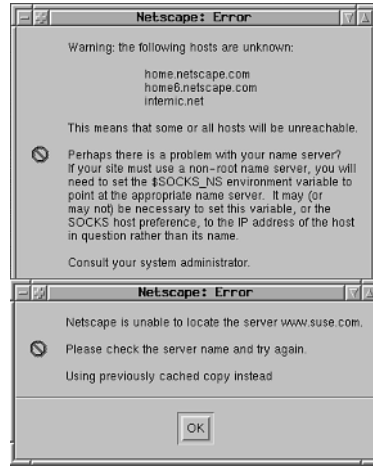


Figure 10.3

Recognizing Netscape errors.

In the preceding figure, you see the comment "warning, the following hosts are unknown." This is an indication that you may have left out an entry for resolv.conf (DNS nameserver). On the other hand, you may not be physically connected to the network or Internet. Check all your connections first, and then look at the /etc/resolv.conf file (use the NAMESERVER option in the System Configuration utility). If no IP address is listed in the /etc/resolv.conf file, adding a nameserver IP address should solve your problem.

The Netscape browser included in this distribution can be configured the same way as in the previous versions. The toolbar selections (located at the top of the browser field) perform the same functions. Although this is a newer version, you should have no trouble finding your way around.

One of the neat features of Netscape is the newsgroup feature. Those who are currently subscribed to a mailing list will find that setting up newsgroups is a simple task. For your benefit, a newsgroup client is integrated into the Netscape Communicator. Figure 10.4 shows the Newsgroup setup screen.

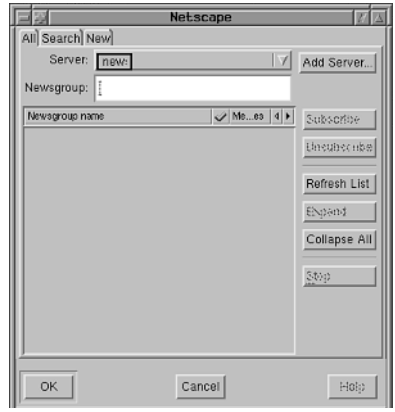


Figure 10.4

Setting up newsgroups in Netscape.

Some of my favorite lists include alt.os.linux.suse, comp.os.linux.announce, and comp.os.linux.security. You can try these for starters; the SuSE list is interesting and is highly recommend for newcomers to SuSE because it discusses current distribution problems and resolutions. The list also provides information on future improvement to SuSE Linux.

Additional information on other features in the Netscape Communicator would fill a good-size book. You can use the Help selection at the extreme upper-right corner of the browser. The information contained in Help will guide you in advanced configurations of the Netscape Communicator.

For more online help on Communicator, see `http://help.netscape.com/`. This Web site will give you information on Netscape's advanced configuration and assist you with technical problems, although I doubt that you will have any.

Individuals and companies that use Netscape as their browser of choice can upgrade their standard 56-bit encryption to 128-bit encryption by adding a package called fortify. This enhancement increases the encryption to international "strong" encryption. This package can be obtained at `http://www.fortify.net`. If you are not sure whether you need "strong" encryption, see the article at `http://www.boran.com/security/sp/int_crypto.html`. This can help define whether you need this level of security.

Overview of Network Services

In this section, you will see how to configure some of the common services that are included in the SuSE Linux distribution. These services include email server configuration, Samba, and IP-Masquerading setups, and all this can be done with the YaST1 utility.

Configurations such as sendmail will not contain a lot of information on how to generate the sendmail.cf file, but the necessary information required by YaST1 will get your email server going.

I will quickly cover the principles behind NFS and NIS; these subjects are extensive and beyond the scope of this installation text. The NFS/NIS overview is designed to give you insight on the reasons why (or why not) you may want to implement these services on you machine.

Let's start with the sendmail configuration.

Configuring Sendmail with YaST1

Configuring sendmail with YaST1 is quick and simple. Without the YaST1 utility, generating a sendmail configuration file is extremely difficult for all but the most seasoned email administrators. SuSEconfig has two configurations available to assist you. You can use the TCP/IP protocol via the Simple Mail Transfer Protocol (SMTP) or by way of UNIX-to-UNIX Copy Protocol (UUCP). The TCP/IP method is used more often when mail is sent or delivered to a remote machine. UUCP is a better suite to deliver mail on local host scenario. Be mindful, however, that this will not work on a UNIX-to–Windows-based environment because the Samba package relies on the TCP/IP protocol to transfer its data. The following instructions outline the YaST1 parameters needed to get sendmail up and running for you.

If you did not set up the parameters for sendmail during the initial installation run, you can have SuSEconfig generate the sendmail configuration file by answering **`yes`** in the YaST1 selection field SENDMAIL_TYPE. If you elect to write your own configuration from scratch, answer **`no`** in this field.

You will have to tell sendmail where you would like the local mail to be stored, or who will be the recipient. Use the SENDMAIL_LOCALHOST option field. If your local hostname is abc.xyz.com, for example, then input, **`localhost abc.xyz.com`**. If there are more local recipients, then add the other names separated by whitespace.

If you handle traffic for incoming mail from the Internet sent to a common address, such as `www.109.org`, and if the host machine is named esther.109.org, then in SENDMAIL_LOCALHOST put **`localhost www.109.org`** (without the quotes) in that field.

If you'd like to send your mail under another name than usually appears on the mail header, use the option FROM_HEADER. You can change the name from esther.109.org to arthur.109.org if you'd like.

If the mail is not delivered locally, sendmail will request the DNS name so that the mail can be delivered by SMTP. Although, in general, SMTP mail servers are reliable, occasionally circumstances such as slow connections or high volumes of network traffic can cause them to halt. If this happens, your mail can't get through. You can opt to use another SMTP mail host that can receive the outgoing mail and deliver it for you. The SENDMAIL_SMARTHOST option will work for that purpose. You'll need to input the name of the smart host in this manner, **`smtp: mail.zyx.net`** in the option field. This is a good idea for those who do not have a permanent connection to the Internet and who use their ISP's SMTP mail server. If you have a UUCP connection and would like to use the smart host option, input **`uucp-dom: uucp.zyx.net`** in the option field.

Depending on your Internet connection, a DNS nameserver may not be available. If this is the case, sendmail will look for a valid email address and exchange it for a fully qualified domain name (FQDN). If the DNS is not resolved, the mail will go undelivered. If you would like sendmail to ignore this DNS feature, and if you are sure that the email address(s) is correct, you can answer **`yes`** to the SENDMAIL_NOCANONIFY option.

You can have sendmail started up during the boot sequence, and the program has the capability to check for mail at predetermined times, which you can set. The `-bd` argument for sendmail initializes the daemon and opens smtp port 25. You can now send and receive mail via TCP/IP connections. If you have a fair amount of daily mail, you can have sendmail check the mail queue at specific intervals. The `-q25m` argument checks the mail queue file, /var/spool/mqueue, every 25 minutes. If you have a non-permanent connection, you may want to connect to the network and issue the command `sendmail -q`, which will send and retrieve all your current mail. If you like, you can place the command `sendmail -q` in the crontab and have the system check once a day. To modify the startup argument options, use the SENDMAIL_ARGS option field.

You should note that sendmail will have a built-in tendency to send your mail immediately. This may not be possible for those who are mobile and who connect once or twice a day. If you set the SENDMAIL_EXPENSIVE option field to **`yes`**, the mail will wait for you to issue the command `sendmail -q` before firing off any of your daily posts.

The option fields listed previously are common and can be modified quickly to suit your needs. This is in no way a complete synopsis of the sendmail program or its features; for more detail, type **`man sendmail`** at the command prompt for additional information. Sendmail also has an extensive Web site located at `http://www.sendmail.org/`. This site has all the latest information about the program, as well as downloads of newer (where applicable) versions. Other sites help you to configure sendmail from scratch—try the sendmail.cf generator, at `http://www.harker.com/gen.sendmail.cf/index.html`. More email administrator tools are located at `http://www.webmin.com/webmin`.

DHCP Configuration

Dynamic Host Configuration Protocol (DHCP) is a network protocol that gives administrators host control from a central point and automates the assignment of Internet Protocol (IP) addresses in an organization's network.

Using the Internet's TCP/IP protocol, each machine that must connect to the Internet needs a unique IP address. You may have mobile computer users; if the computers moves to some other location in another part of the network, a new IP address must be entered. DHCP lets the network administrator supervise and assign IP addresses from a central point, and automatically sends a new IP address when a computer is plugged into a different place in the network.

If you would like to start the DHCP server, use the START_DHCP option and answer **`yes`**.

Due to the amount of variables involved in configuring the DHCP client, I advise you to look at `http://sdb.suse.de/sdb/en/html/katlist.NETDHCP.html`. This SuSE support site gives more details than I can provide in this overview. In addition, the DHCP HOWTO is another great resource.

NFS Service Overview

The Network File System (NFS) is a client/server application that gives a computer user an opportunity to view and, in some cases, store and update file(s)on a remote computer as though they were on the user's own computer.

NFS is designed to support a UNIX/Linux filesystem. It also will support such filesystems as MS-DOS.

The need for distributed file resources and the element of filesystem security will determine the advantage or disadvantage to using this type of system. You may want to provide this type of service if a significant number of your users are remote from a central location during the day, and you would like them to have access to the files.

If you intend to run the NFS server, these parameters must exist: START_PORTMAP [yes]—without the portmapper daemon running, rpc.mountd (mount) and rpc.nfsd (filesystem) will not start, and NFS will not operate.

You'll also need to enable the option NFS_SERVER; this service will start rpc.mounted and rpc.nfsd.

If you would like NFS to convert the user IDs and the group IDs, select the NFS_SERVER_UGID [yes] option. Another setting, the REEXPORT_NFS [yes] option, can also be adjusted through YaST1. If you want to re-export mounted NFS directories, use this option.

Details on setting up an NFS environment are located at `http://metalab.unc.edu/mdw/HOWTO/NFS-HOTWO.html`.

The Network Information System (NIS) is a network naming and administration system for smaller networks. It masks the network operation (for different machines) and offers the user a seamless network environment. By design, it is intended for use on local area networks (LANs).

As with NFS, NIS uses the client/server model and the Remote Procedure Call (RPC) interface for communication between hosts, so the portmapper daemon must be running to use NIS.

As a note, NIS was originally called Yellow Pages, but someone had already trademarked that name, so it was changed to Network Information System. SuSE Linux still refers to NIS as "YP" (Yellow Pages).

To create a YP (NIS) configuration through the YaST1 utility, select CREATE_YP_CONF [yes].

To identify the domain name used for the YP (NIS) server, use the option YP_SERVER <server-name-.com>. The domains for the YP (NIS) host(s) should be entered in the YP_DOMAINNAME option field.

If your system is configured for name resolution, you can also use YP (NIS) to resolve the queries for hostnames by setting the option USE_NIS_FOR_RESOLVING and to yes.

If you will to use YP (NIS) as a service on your network, consult the HOWTO for NIS, located at `http://metalab.unc.edu/mdw/HOWTO/NIS-HOWTO.html`, for extensive detail on the inner workings of this type of service. You have obvious security issues to consider. The system must be capable of reading /etc/passwd, /etc/shadow, and /etc/groups over the network connection. There are a lot of merits to the system. You will ultimately weigh out the cost/risk benefits and then proceed accordingly.

Samba Configuration Tips

The Samba program contains some of the most sought-after capabilities available in the Linux distributions. It enables the Linux machine to operate as a network server in a Windows or DOS environment. This program bridges the integration gap that sometimes exists in multiplatform environments. SuSE includes in its distribution a simple configuration tool, called swat, that provides a Web page-type interface for setting up your Samba system. For more details on how swat works, type at the command line **`#man swat`**.

YaST1 will help you set up printers to use samba. Issue the command `# yast`, and select System Administration. Then choose Network Configuration, and choose the option Connect to Printer Via Samba.

These two features can assist you in getting Samba connected and integrated into the network. SuSE's man pages contain information on the configuration of Samba; type **`#man smb.conf`** at the command prompt. The main Samba site is located at `http://us1.samba.org/samba/samba.html`.

FTP Programs

File Transfer Protocol (FTP), an Internet protocol, is designed to exchange files between computers on the Internet. There is a multitude of excellent FTP programs in the Open Source camp; we will look at only two of them: NCftp and wget.

NCftp FTP Client

NCftp is an enhanced version of the FTP program. It automates many of the login steps necessary with FTP and adds its own special features.

For example, when logging into a remote site, NCftp automatically sends the username and password strings for anonymous access for you. Most NCFTP commands are identical to the standard FTP commands. This means that the same commands are used for moving files, changing directories, listing directory contents, and so on as you would use in the FTP program.

NCftp has a neat feature that retains information on the last directory that you accessed on a FTP site; the next time you log into that site, you will be placed back at that directory automatically. NCftp is a lifesaver if you download a lot of files.

The official NCftp site is located at `http://www.ncftp.com`. More information, such as the FAQ on NCftp, is available at `http://www.ncftp.com/ncftpd/doc/faq/`.

Wget FTP Client

The wget utility is a network utility for retrieving files from the Internet using HTTP and FTP. This tool has many features to make retrieving large files or mirroring entire Web or FTP sites easy.

The wget utility is flexible in nature and performs a vast array of tasks. To get more insight on how wget can help you, see `http://www.lns.cornell.edu/public/COMP/info/wget/wget_toc.html`. This site contains information on daily use and client configuration.

Firewall Configurations

A firewall is a group of related programs, installed on a network gateway server, that protects the data and resources of a private network from users from other networks.

The firewall program that is provided by SuSE is not very elegant. It is clearly defined as "an intelligent packet filter" that is assisted by the IP Chain program, which takes

care of the routing duties. Refer to `http://www.linuxdoc.org/HOWTO/IPCHAINS-HOWTO.html` for details. For detailed uses for IP Chains, see `http://www.rustcorp.com/linux/ipchains/HOWTO-4.html`.

This program is also a solution to some small businesses that would like to have an internal network structure and have access to the Internet at the same time.

WARNING

You should understand that the firewal program is not a full-strength firewall application. If you are in an extremely hostile network environment, or if you have secure data that is important to you, I would not recommend using the firewal program as a final security solution. You may want to contact additional software vendors that specialize in security software—point your browser to `http://www.alw.nih.gov/Security/prog-firewall.html` for information on Linux firewall programs.

If you are considering the firewal program, chances are that you have some type of dedicated network connection. If you are using a DSL or some other high-speed connection, the following instructions will get you and the rest of your network up and running.

Configuring the firewal program

To run the SuSE firewall, you must make sure that the package called firewal is installed.

The external network connection (firewall side) will require an FQDN that is recognized on the Internet. Your eth0 device (NIC card) is usually your external connection. You can use YaST1 to configure the eth0 device. You will need to invoke YaST; then choose the System Administration menu and choose Network Configuration, and use the Network Base Configuration submenu to input the outside IP address and the standard default gateway address.

You'll now need to configure the second card, which will be eth1. This card is your internal firewall device, a route to the outside world. Use the standard default gateway address that you input for the eth0 device. The firewall machine (packet filter) is now configured as a firewall/router.

It's time to configure the internal network. Unlike the external network connection, the internal network does not require an FQDN. If you like, you can create your own internal network name.

When configuring the IP addresses, you can use the reserved network numbers 192.168.1.2 up to 192.168.1.254 (It's doubtful that you would put 254 machines on one connection, though). You will use the internal network interface card address for your default gateway address.

Now comes the fun part. If you already have a network connection, you will need to obtain the current firewal package, which is available at the SuSE FTP site. This package will correct some symlink problems found in the initial release of firewall.

To download the file, invoke YaST1 and select Choose/Install Packages; then select the Install Packages submenu. Press the Enter key, and select FTP from the drop-down menu that appears in the upper-left corner of the screen. The IP address for SuSE is already programmed into the installer. You'll find the new package listed under the sec1 directory. After downloading the package, install the package with the YaST1 utility. Types in **yast** at the command prompt, and select Install Packages. Then press the Enter key and choose the directory where you downloaded the software. Locate the software, select the software for install by putting an X beside the selection, and press the F10 key. The software will be installed.

Now you are ready to edit the configuration file. If you choose to edit the configuration file by hand, load your favorite editor and pull up the /etc/rc.config.d/firewall.rc.config file. I'll use the joe editor for now.

```
# joe /etc/rc.config.d/firewall.rc.config
```

Figure 10.5 shows some of the contents of the /etc/rc.config.d/firewall.rc.config file.

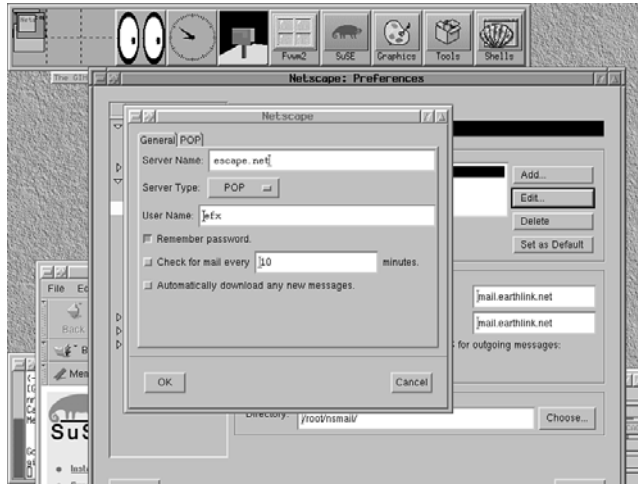


Figure 10.5

Firewall program configuration file.

The configuration file instructs you on which parameters need to be added or modified based on the current use of the machine. When you have made all the necessary changes to the /etc/ rc.config.d/firewall.rc.config file, save the file and reboot the

machine. This reinitializes the firewall; with the upgraded firewal program installed, the IP Chain startup script will work now, and no other modifications or commands will be required to route your internal traffic to the Internet.

You also can use the YaST1 tool to edit the configuration file. From the main menu of the YaST1 program, choose System Administration; then select the Change Configuration File option. The parameters shown in table 11.2 can be changed while using YaST1.

Table 10.2 Modifiable Parameters in YaST1

Parameter	Description
FW_ALLOW_FW_SOURCEQUENCH	Notes if connection is choking
FW_ALLOW_FW_TRACEROUTE	Allows traceroute to the firewall
FW_ALLOW_FW_INCOMING_HIGHPORTS_TCP	Allows TCP traffic above port 1023
FW_ALLOW_FW_INCOMING_HIGHPORTS_UDP	Allows UDP traffic above port 1023
FW_ALLOW_PING_DMZ	Allows pings to the DMZ machine inside the firewall
FW_ALLOW_PING_FW	Allow pings on the Firewall/DMZ box
FW_AUTOPROTECT_GLOBAL_SERVICES	Prevents access to unbound ports such as 0.0.0.0:21
FW_DEV_DMZ	Gives IP address(s) of network interface(s) that point toward the DMZ box
FW_DEV_INT	Gives IP address of the internal network interface
FW_DEV_WORLD	Gives IP address of the external network interface
FW_FORWARD_TCP	Forwards TCP services to internal (or DMZ) network
FW_FORWARD_UDP	Forwards UDP services to internal (or DMZ) network
FW_KERNEL_SECURITY	Sets additional TCP/IP security features
FW_LOG_ACCEPT_ALL	Enables firewall log for all accepted connections
FW_LOG_ACCEPT_CRIT	Enables logging of accepted "critical" connections
FW_LOG_DENY_ALL	Enables logging of all denied connections
FW_LOG_DENY_CRIT	Enables logging of denied "critical" connections

Parameter	Description
FW_REDIRECT_TCP	Allows TCP services to be redirected to local port(s) on the firewall
FW_REDIRECT_TCP	Allows UDP services to be redirected to local port(s) on the firewall
FW_ROUTE	Activates routing between the Internet and the internal network
FW_SERVICES_DMZ_TCP	Specifies TCP services allowed in DMZ
FW_SERVICES_DMZ_UDP	Specifies UDP services allowed in DMZ
FW_SERVICES_EXTERNAL_TCP	Specifies TCP connections from the Internet or other untrusted networks
FW_SERVICES_EXTERNAL_UDP	Specifies UDP connections from the Internet or other untrusted networks
FW_SERVICES_INTERNAL_TCP	Specifies TCP connections from internal networks
FW_SERVICES_INTERNAL_UDP	Specifies UDP connections from internal networks
FW_SERVICES_TRUSTED_TCP	Specifies trusted TCP port connections (25 or stmp)
FW_SERVICES_TRUSTED_UDP	Specifies trusted UDP port connections (53 or domain)
FW_SERVICE_DHCLIENT	Enables DHCP client filtering
FW_SERVICE_DHCPD	Enables DHCP server filtering
FW_SERVICE_DNS	Enables DNS server filtering
FW_STOP_KEEP_ROUTING_STATE	Keeps routing on if the firewall is unloaded or stopped
FW_TRUSTED_NETS	Specifies trusted Internet IP addresses



NOTE

If you use YaST1 to configure the firewall, I strongly recommend viewing the contents of the /etc/rc.config.d/firewall.rc.config file before making any changes. The file contains detailed configuration information that is not presented in the YaST1 tool.

SuSE's firewal program is well designed and implemented, but some might need a different type of setup. A good program to check out is PMFirewall. It is easy to install

and configure. This software can be obtained at http://www.pointman.org. It has received a number of favorable reviews, so it may be worth your while to look into it.

If you would like to build a stronger firewall configuration file, try the linux-firewall-tools Web site (http://linux-firewall-tools.com), which will help you configure a custom tailored rc.firewall script. This is a great resource for those who need a stronger rule set but don't need a commercial type application. For more details on the linux-firewall-tools program for LAN environments, see http://linux-firewall-tools.com/linux/faq/index.html.

Managing the Network Summary

This chapter helped you define the services and features that you will run on your SuSE Linux machine. With so many optional services to provide, narrowing down the choices can be the hardest part. We've looked at information that can help you identify the configuration file(s) and some of the parameters to work with. You have received directions on how to start a service, or you have been guided to an information source that will help to get network service configured. You also got an overview of some of the most widely used network filesystems and got a brief look at the NIS protocol that helps network administrators provide their users with a transparent (seamless) work environment. The FTP client section was not actually a configuration issue, but it may represent a significant utility in the daily arsenal of tools. Finally, we presented some information on the firewall programs and configuration of a small home or business network, giving multiple computers access to the Internet via one SuSE Linux machine. This should help get you out of the network box and allow you to cruise down the Information Super Highway. Happy trails!

CHAPTER 11

Sound for SuSE Linux

Sound—what a wonderful thing. The computing experience is enhanced to a certain extent by its presence, and the recent sound driver development has brought sound to more Linux boxes than ever.

As a quick refresher, here's why the drivers for sound cards have taken so long to incorporate into the distribution(s). Sound card initialization occurs on the kernel level. The drivers must be built into the kernel, or a loadable module must be supplied to activate the card. Because the Linux platform was designed as a UNIX clone and connectivity, and because filesystem flexibility was paramount, the sound drivers were not high on the priority list. Now that Linux has crested the mount of viability, new tasks—including sound—must be handled.

The capability to interface with sound devices is no longer focused on playing CDs or providing sound effects on games. The issue of telephony has created a new frontier. Linux is a network operating system by design—what better way to take advantage of its natural capability and expand its reach even further. Without the facilities to record and reproduce sound, Linux will not grow at a linear rate.

The use of ISA bus for sound cards was predominant a few years ago. The trend recently has shown that the PCI bus-type cards are becoming the standard, and the ISA cards are destined to be phased out soon. The good thing about PCI-type cards lies in the fact that the computer automatically allocates the I/O and IRQ resources.

The ISA cards that started out with a jumper-type setting evolved to ISA PnP-enabled cards. The Plug and "Pray" card

sometimes posed configuration problems due to an internal setting that sometimes conflicts with another device. Fortunately, the isapnp tool attempts to find the PnP card and supply some configuration information. Later sections in this chapter review the use of this tool. Please see the section "The isapnptools Utility."

Quite a few sound development projects are in the works. The two dominant projects are Open Sound System (OSS) and Advanced Linux Sound Architecture (ALSA). The OSS/Free drivers are incorporated in the kernel, the ALSA drivers come as prebuilt modules. I'll give you an overview of each driver set next.

Open Sound System (a.k.a. OSS)

Hannu Savolainen led the effort to develop sound drivers compatible with Linux. First called Voxware, the name changed to Ultra Sound System (USS). As driver development accelerated, Savolainen joined the 4Front Technologies team, a company that markets a proprietary sound solution for the UNIX platform. Working full-time with 4Front, Savolainen handed off the maintainer duties to Alan Cox. Cox who is well known for the 'ac' kernel patches, keeps quite busy in kernel development for sound drivers. More information concerning his progress can found at `http://www.4front-tech.com/ossfree/index.html`.

The kernel-supplied version of the OSS drivers is called OSS/Free, otherwise know as the Linux Sound System. The main site is located at `http://www.linux.org.uk/OSS` and contains valuable information on issues concerning setup and compatibility.

4front supplies sound drivers for various UNIX/Linux applications. SuSE is kind enough to provide a demo copy of the Open Sound 3.9.2 drivers in the Pay section, under the heading `opsodsmp`. More information on Open Sound System can be found at `http://www.opensound.com`.

One other project, hosted by MIT, is called Csound. This effort is pretty diverse and includes great tutorials and a mountain of current documentation. The Web site is located at `http://mitpress.mit.edu/e-books/cscund/frontpage.html`.

There are other groups working on sound reproduction. Groups like the GNOME and Enlightenment teams at `http://www.uk.gnome.org/white-papers/esd/esd/`. Their efforts have been ceaseless, and improvements continue on a daily basis. For more detail on the overall project, see `http://www.gnome.org`.

Using the Open Sound Drivers

You can imagine the frustration of have a "working" sound card, installing SuSE Linux, and suddenly rendering the card inoperative. You have a couple choices: to purchase the commercial drivers available from 4Front, or to recompile the kernel and use the OSS/Free drivers. I must say that the OSS package tends to be easier to install and configure. The only tradeoff is that if you want to keep it, you must pay for it (about $20), and you do not receive the source code.

If you lean toward Open Source solutions, the kernel drivers will be your best bet. This requires you to recompile the kernel and install the proper driver. In the following section, you'll find an overview of installation for the OSS/Free drivers.

Installing the OSS Sound Drivers

The Open Sound demo drivers are pretty easy to install. You'll need to locate the ossinstall program file and run the install script. The prompts will direct you through the process. When you complete you configuration, issue this command:

```
soundon
```

If you have decided to use the kernel sound drivers, you will need to reconfigure the kernel parameters. (Refer to Chapter 9, "Tailoring a Custom Kernel.") You can choose to integrate the drivers into the kernel or build the required driver module. Figure 11.1 shows the `make xconfig` selection screen. The OSS drivers have been selected as kernel components, not as modules.

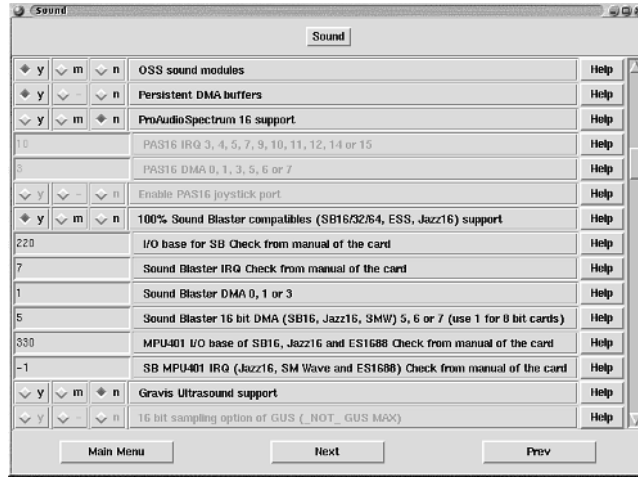


Figure 11.1

Linux Kernel Sound Configuration Menu (OSS/Free).

When the kernel is recompiled, you can restart the system and observe the `dmesg` output to confirm that the sound device is recognized and initialized. If the drivers were built as modules, you can use the `lsmod` command or `run modprobe -c` to verify a clean build and proper loading of the module. The command `/dev/sndstat` reveals information regarding your sound card and driver.

Remember that, when configuring the kernel, you have quite a few choices for selecting your sound card. Make sure that you have checked the correct one and any

associated driver options. The Help feature within the configuration tool can be a lifesaver—in most cases, it gives an explanation of the purpose of each option. Always select options to the best of your knowledge, using specifications that can be verified (I/O, IRQ, and MPU).

SoundBlaster Live users will breathe a sigh of relief because Creative is now providing support for this card. The elusive driver information is available at `http://opensource.creative.com`.

Support is not available in the kernel, so no module can be built. This URL is the manufacturers' way of getting into the Open Source revolution.

ALSA Sound Drivers

The Advanced Linux Sound Architecture project has taken on the task of developing a quality sound driver system. Reports indicate that the ALSA drivers will become fully integrated into the Linux kernel. The driver development started out as the Linux Ultra Sound Project, headed up by Jarsolav Kysela, who continues to coordinate and lead the project. ALSA driver modules are available during the install phase, as you can see in Figure 11.2.

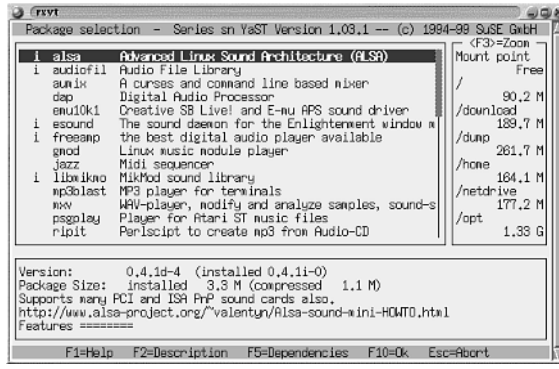


Figure 11.2

Choosing the ALSA Software Package.

SuSE Linux will install the sound system, driver modules, and necessary files for normal operation with the version 2.2.13 kernel. Figure 11.3 shows a partial list of ALSA sound modules.

These prebuilt modules are convenient because you will not need to recompile the kernel to supply the correct driver. Neat, huh?

Configuring AlSA Sound Drivers

The ALSA Sound System has a configuration tool that is invoked by issuing this command:

```
alsaconf
```

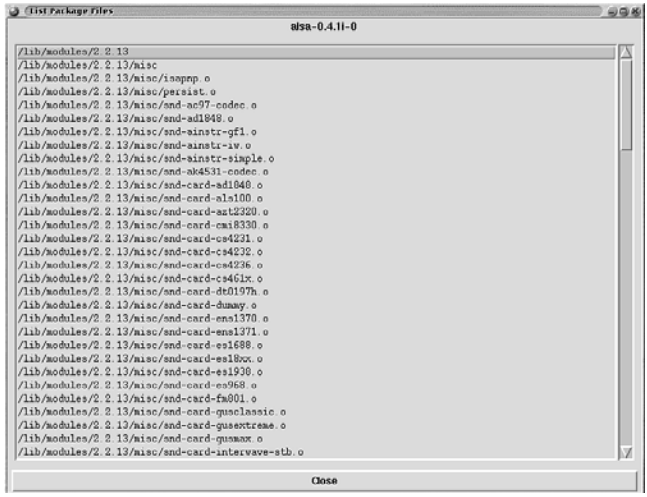


Figure 11.3

Sound Modules provided by ALSA Software.

This command gives you an ALSA configurator interface, as you can see in Figure 11.4.

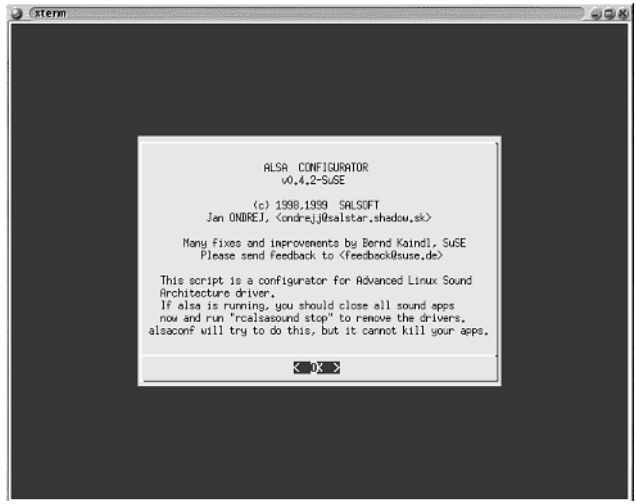


Figure 11.4

ALSA Sound Configurator.

The program attempts to autodetect your card; if `alsaconf` does not find it, you will be presented with a list of cards. There you can choose the correct card and the proper

I/O, IRQ, and other required settings. The setting will be saved in /etc/modules.conf. The menu interface also enables you to prepare the card for use by loading the module and adjusting the mixer settings.

The isapnptools Utility

The ISA Plug-and-Play cards generally are supported if the resources can be configured properly. The isapnp tool set is designed to do just that: probe the card and verify the available resource settings. It consists of two elements: pnpdump and isapnp.

The pnpdump Utility

This tool probes the system for all PnP-type cards and then produces an output that gives a count of the available card and their associated addresses. This might seem to be elementary information, but the manual configuration of a sound card can be tedious and time consuming. If you have a limited knowledge of the tool, it might not help you overall.

The output of pnpdump should be directed to a configuration file. This is done by issuing the command:

```
pnpdump > /etc/isapnp.conf
```

After you run this command, verify its existence. In Figure 11.5 you see the typical dump output:

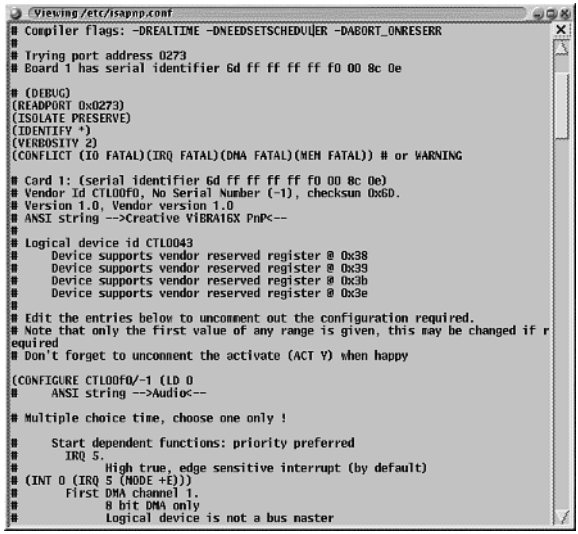


Figure 11.5

Output of pnpdump Utility.

You can now move on to the next step. Final configuration steps include editing (uncommenting the proper resources adresses) the .conf file.

The isapnp Utility

The isapnp tool checks resources that are available based on how the other related devices are currently configured.

It then reads the isapnp.conf file. The whole file must be read, or a debug message will appear. This debug message can be caused by a conflict or bad resource address, and it helps when you are not sure which device is causing the problem. Figure 11.6 shows the output for one ISA card. Issue this command:

```
isapnp /etc/isapnp.conf
```

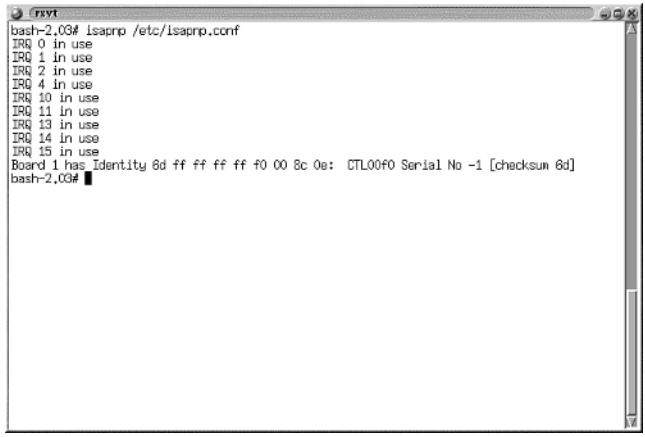


Figure 11.6

Sound Card identified by the isapnp Utility.

If isapnp is successful in reading the file, it edits (uncomments) the proper setting for you, and you simply need to restart you system and make sure that the sound module was loaded.

This command lists all loaded modules:

```
lsmod
```

If you still have problems, type this command for more detailed information on these tools:

```
man pnpdump or man isapnp
```

You also can check in for additional information in the "Troubleshooting" section located in Appendix B, "Troubleshooting SuSE Linux."

At the time of this writing, the current version of isapnptools is 1.21b. You will find additional documentation on this toolkit at `http://www.roestock.demon.co.uk/isapnptools/`.

ISA sound card configuration can be a task, but it is well worth it when you have the sound experience.

Sound Summary

To adequately cover the issue of sound on a Linux machine would probably take up a fair-sized book. This brief chapter serves to help you find the resources required to get your sound card operational. The URLs listed are very helpful—use them judiciously. The OSS and ALSA project are well documented, and the configuration tools also will help immensely. The included software will give you a chance to test both applications: I like the OSS/Free driver in the kernel, but ALSA continues to close the narrow gap.

CHAPTER 12

Keeping Your System Up to Date

All who have spent a significant amount of time in the computer industry have run into the problem of outdated software applications. The story is the same everywhere, just the names are changed to protect the unyielding.

A few years ago, I experienced a problem with a program that supplied warranty-coding numbers based on a specific ID. The operating system was UNIX (a good point), which utilized a proprietary software application (possibly a bad thing) that needed serious modifications to the warranty-coding program. Over a two-year span, I worked with the regional representative and talked with the company's programming adviser, recreating the scenario in which the program failed to respond correctly. He was sympathetic and told me that the programmers were working on a fix and that the problem should be solved in the next version update. When the upgrade came, I waited with baited breath, hoping that the problems had been rectified. Low and behold, the update contained new coding options, but all the problematic codes remained in the system, adding insult to injury.

This scenario will not be found in SuSE Linux. The programmers responsible for correcting the errors in the aforementioned program did not have their reputation on the line—they were concerned only the issue of dollars and cents. This is not meant to degrade them or their abilities, but it is intended to point out that the presence of outdated software is not a prevalent condition in the Open Source camp. For example, consider this next incident.

With everyone in a panic about Y2K, I felt reasonably sure that my Linux machines would in no way be affected by the arrival of the year 2000. Returning home at a little after 1 a.m., I found everything to be in order. I awoke the next morning and started X and pulled up my favorite file manager, FileRunner. To my surprise, the file dates read 1000 rather than 2000—yikes! I mumbled and grumbled and heard my wife say, "Check and see if they have a new version online." Sure enough, the FileRunner Web page showed that the author had released an upgraded version that handled the date-change problem, three days prior to January 1. This Open Source program was free of charge, so the maintenance of the program is voluntary. The diligence to detail is evidence of a different outlook on performance.

The Importance of Updating Your Software

The issue of updating your software could extend to the factor of security. All Linux applications are not produced by the same individuals, so there might be small inconsistencies that can allow users unwanted (and authorized) privileges. There are teams of experts whose daily task is to find the flaws in Linux applications. One of these groups is the X-Force (`http://xforce.iss.net.about.php3`).

For more information on security, see Chapter 13, "Securing the Network."

If you have a single machine that is *not* connected to other computer(s) or the Internet, and if all the applications operate properly for you, then updating the software might be moot for you. In most cases, SuSE Linux has been chosen to facilitate a network connection for one or more computers. In this case, updates generally are required.

Getting Updates from SuSE.com

Where you get your updates is just as important as the upgrade process itself. If you cannot trust the source, the upgrade is not an upgrade. I recommend getting your updated files from `ftp.suse.com`, to help ease some of the safety concerns. This ftp site is supported by SuSE, and the .rpm software has MD5 checksum capabilities.

The MD5 algorithm is intended for digital signature applications, in which a large file must be "compressed" in a secure manner before being encrypted with a private (secret) key under a public-key cryptosystem such as RSA. This will help you determine whether a file has been modified from its original state. With SuSE Linux, you have plenty of options: using the rpm package format, installing compiled binaries, or building from source. As long as you are familiar with how your system is configured, you'll have no problems.

The whole debate about performing updates is this: How can I be sure that I have received the most current files? Some distributions have highly intelligent package management. In terms of interactive and flexible updating, I would not consider a SuSE system to be no. 1, although a strong no. 2 certainly is feasible. Again, the multitalented YaST1 will be your interface. All you need to do is bring up the YaST1 menu and select first Choose/Install Packages and then Install Packages. Figure 12.1 shows the YaST1 menu selection.

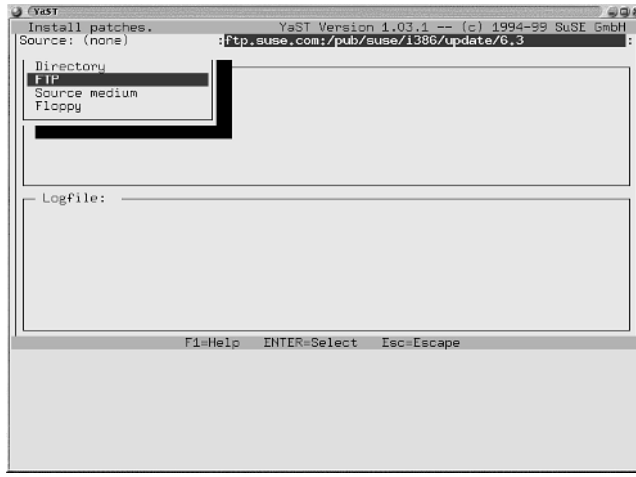


Figure 12.1

YaST1 Install Packages selection screen.

When you reach this point, you'll have multiple selections—choosing *ftp* automagically connects you to the SuSE ftp server. This is a nice integrated feature: The YaST1 update program browses the software on your system, and when a directory is chosen for update (for example, sec1, pay1 or xaps), YaST1 indicates whether the package is installed and whether an updated version is available. Going further, YaST1 installs the program and updates the config files on the system. You can even back up a copy of the .rpm file in /var, if you'd like.

Figure 12.2 shows the completed install of updated software.

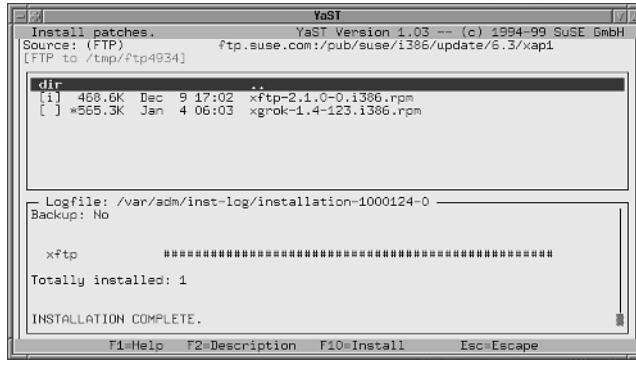


Figure 12.2

YaST1 Package updating results.

If you run a large site, you might want to download all the updates and burn them onto CDs. You then can use the CD method to update additional machines. This is usually the case when users are restricted in installing software application themselves.

The Official SuSE ftp server for patches and updates is `http://suse.de/en/support/download/updates/63_update.html`.

The security announcements regarding updates and bugfixes can be found at `http://www.suse.de/en/support/security/index.html`.

Using Mirror Sites

In Table 12.1, you will find a list of mirror sites that you can use to download updates and other types of software applications. Please beware that *any* software repository can be compromised and that the software can be modified to contain something other than the original author intended. Acquaint yourself with the various sites, and make inquiries, if possible, to establish the nature of the site in question.

Table 12.1 Ftp mirror sites for SuSE Linux software

Country	URL	Description
Argentina	`ftp://ftp.unc.edu.ar`	SuSE Linux (/pub/Linux/SuSE/)
Austria	`gd.tuwien.ac.at` (Wien)	SuSE Linux (/linux/suse.com/); updates, bugfixes, kernel sources (/linux/suse.com/suse/)
Brazil	`master.softaplic.com.br` (Belo Horizonte)	SuSE Linux (/pub/susix/); updates, bugfixes (/pub/susix/suse_update/)
	`ftp.genix.com.br` (Fortaleza, Ceara)	Updates, bugfixes, kernel sources (/pub/suse_update/)
Canada	`ftp.crc.ca` (Ottawa)	SuSE Linux (/pub/systems/linux/suse/)
Finland	`ftp.funet.fi`	SuSE Linux (/pub/mirrors/ftp.suse.com/pub/suse/); updates, bugfixes, kernel sources (/pub/mirrors/ftp.suse.com/pub/SuSE-Linux/suse_update/)
France	`ftp.ese-metz.fr`	SuSE Linux (/pub8/)
	`ftp.iut-bm.univ-fcomte.fr`	SuSE Linux (/pub2/linux/distributions/Suse/suse/); updates, bugfixes, kernel sources (/pub2/linux/distributions/Suse/suse/i386/update/)
Greece	`ftp.ntua.gr` (Athens)	SuSE Linux (/pub/linux/suse/suse/); updates, bugfixes, kernel sources (/pub/linux/suse/SuSE-Linux/suse_update/)
	`ftp.linux.gr`	SuSE Linux (/pub/mirrors/ftp.suse.com/)
	`ftp://ftp.duth.gr`	SuSE Linux (/pub/suse/)

Country	URL	Description
Hungary	`ftp.bke.hu`	SuSE Linux (/pub/mirrors/SuSE/); updates, bugfixes, kernel sources (/pub/mirrors/SuSE/i386/update/)
Italy	`ftp.cnr.it`	SuSE Linux (/pub/Linux/distributions/suse/)
	`ftp.flashnet.it`	SuSE Linux (/mirror/13/suse/)
	`ftp.uniroma2.it` (Rome)	SuSE Linux (/%7BA/Linux/SuSE/); updates, bugfixes, kernel sources (/%7BA/Linux/SuSE/suse_update/)
Netherlands	`ftp.surfnet.nl`	SuSE Linux (/mirror/linux/distributions/suse/); SuSE Linux (/pub/suse/); updates, bugfixes, kernel sources (/pub/suse//i386/update/)
Norway	`sunsite.uio.no`	SuSE Linux (/pub/unix/linux/SuSE/); updates, bugfixes, kernel sources (/pub/unix/linux/SuSE/i386/)
Poland	`ftp.ds14.agh.edu.pl`	SuSE Linux (/mirror/suse/)
	`ftp.task.gda.pl`	SuSE Linux (/mirror/ftp.suse.com/pub/suse/); updates, bugfixes, kernel sources (/mirror/ftp.suse.com/pub/suse/i386)
Portugal	`ftp.fct.unl.pt`	SuSE Linux (/pub/mirror-sunsite.unc.edu/distributions/suse/)
	`ftp.puug.pt`	SuSE Linux (/pub/linux/distributions/suse/)
Russia	`ftp.chg.ru`	SuSE Linux (/pub/Linux/SuSE/suse/); updates, bugfixes, kernel sources (/pub/Linux/SuSE/suse/update/)
Spain	`paraiso.disca.upv.es`	SuSE Linux (paraiso.disca.upv.es/mirror/suse/); updates, bugfixes, kernel sources (paraiso.disca.upv.es/mirror/suse/update/)
Sweden	`ftp.sunet.se`	SuSE Linux (/pub4/os/Linux/distributions/suse/suse/); updates, bugfixes, kernel sources (/pub4/os/Linux/distributions/suse/suse_update/)
Switzerland	`sunsite.cnlab-switch.ch`	(Zürich) SuSE Linux (/mirror/SuSE/suse/); updates, bugfixes, kernel sources (/mirror/SuSE/suse_update/)

continues

Table 12.1 continued

Country	URL	Description
	ftp.datacomm.ch	SuSE Linux (/pub/suse/suse/); updates, bugfixes, kernel sources (/pub/suse/suse_update/)
Thailand	ftp.nectec.or.th	SuSE Linux (/pub/mirrors/linux/distributions/suse/)
U.K.	unix.hensa.ac.uk (Canterbury)	SuSE Linux (/mirrors/ftp.suse.com/pub/SuSE-Linux/); updates, bugfixes, kernel sources (/mirrors/ftp.suse.com/pub/SuSE-Linux/suse_update/)
	sunsite.doc.ic.ac.uk (London)	SuSE Linux (/Mirrors/ftp.suse.com/pub/SuSE-Linux/); updates, bugfixes, kernel sources (/Mirrors/ftp.suse.com/pub/SuSE-Linux/suse_update/)
U.S.A.	ftp.cdrom.com (California, Concord)	SuSE Linux (/pub/linux/sunsite/distributions/suse/)
	ftp.varesearch.com (California, Mountain View)	SuSE Linux (/pub/mirrors/suse/SuSE-Linux/); updates, bugfixes, kernel sources (/pub/mirrors/suse/SuSE-Linux/suse_update/)
	ftp.wgs.com (Colorado, Aurora)	SuSE Linux (/pub/Linux/SuSE/); updates, bugfixes, kernel sources (/pub/Linux/SuSE/suse_update/)
	ftp.twoguys.org (Georgia, Atlanta)	SuSE Linux (/suse/); updates, bug fixes, kernel sources (/suse/update/)
	ftp.cso.uiuc.edu/ (Illinois, Urbana)	SuSE Linux (/pub/systems/linux/sunsite/distributions/suse/)
	herbie.ucs.indiana.edu/ (Indiana, Bloomington)	SuSE Linux (/linux/suse/i386/); updates, bugfixes, kernel sources (/linux/suse/i386/update/)
	metalab.unc.edu (North Carolina, Chapel Hill)	SuSE Linux (/pub/Linux/distributions/suse/)
	http://www.cee.odu.edu/ (Virginia, Norfolk)	/SuSE Linux

These are mirror sites recognized by SuSE; use them at your own discretion. Find the tightest-security site, and stick with it.

The rpmfind utility is another way to update your software. It, too, takes an inventory of installed packages, makes a connection to rpmfind.net (an rpm file repository), and updates your packages. To get it to work, just issue this command:

```
rpmfind   --latest <package name>
```

The concept of the tool is excellent, yet functionality is limited. Rpmfind has no configuration file available to edit. This is a sore spot—having no capability to change the update site location and how my updates are received (stored on the system) makes me unsure of this tool's benefits.

The proven tools such as xrpm and GNOrpm are also available in this distribution. Both offer the GUI interface and ftp capabilities. You can get more details on these tools by looking at `/usr/doc/packages_<gnorpm>_<xrpm>`.

Using Other Linux Software Sites

As mentioned in the earlier section "Getting Updates from SuSE.com," the source location of updates is critical. I also recommend that you use wisdom when obtaining everyday software applications. If you are installing applications networkwide, you'll obviously want to stick to proven applications. If you are into research and development, then you might have a test box. Here are some of the places where I like to peruse for new applications:

- **`http://freshmeat.net`**—The Freshmeat Web site, which contains new Linux applications
- **`http://www.linuxnow.com/library.shtml`**—The LinuxNow File Library
- **`http://www.linux.org/apps/index.html`**—The Linux Online Application Index
- **`http://stommel.tamu.edu/~baum/linuxlist/linuxlist/linuxlist.html`**—The Linux Software Encyclopedia

The list could go on for several more pages—these are just a few suggestions.

Backing Up Files

In the course of updating your system, you will undoubtedly exercise caution. Be sure to select a secure ftp location and also back up all critical files prior to the actual upgrade.

SuSE Linux contains GNU software and also a time-limited software package.

Using Free Solutions

The backup utility cpio comes with the SuSE Linux package. For details on specific commands to use, enter this command:

```
man cpio
```

Another Open Source backup utility, flexbackup, is also pretty good. You can obtain a copy at `http://members.home.com/flexbackup/RPMS`.

If these two are not what you're looking for, continue your search on the Internet, and try some of the URLs listed in the earlier section, "Using Other Linux Software Sites."

SuSE Linux includes a backup utility in YaST1—being integrated into the distribution is a plus. Figure 12.3 shows the backup menu for YaST1.

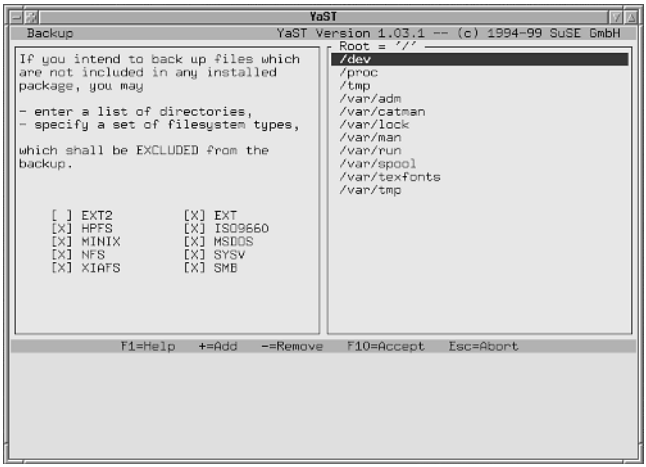


Figure 12.3

The YaST1 Back-up Utility Interface.

I suspect that now you might believe the statement that I made previously about YaST1: It is a "Swiss knife" utility. With its easy-to-follow menu, backups should never be avoided.

Using Commercial Solutions

The Arkeia backup software is contained in the SuSE Linux distribution. This highly rated software is designed for use in big-iron shops, such as ISPs, enterprise servers, and high-availability applications. Remember, this is a commercial application, so time limits are imposed—if you like it, you can buy it at `http://www.knox-software.com`.

Another company, BRU, has developed the Linux backup program called BRU, which is short for Back-up and Restore Utility, same as the company's name. In fact, BRU has been developing products for Linux since 1994. I have used this tool with other Linux distributions, and it performs reasonably well. It is not included on the CD-ROM; however, you can find more information at `http://www.bru.com`.

Updating Summary

Staying apprised of security and bugfixes is a normal part of computer system operations. The challenge is, will you keep up the pace? Linux is moving at a high rate of speed, and being aware of this will help you sustain a secure, up-to-date system. I run multiple distributions in my network, and keeping up with all of them is tedious but

rewarding. Find an ftp site that is safe and secure (as much as possible), and factor in systemwide (security-related) updates and perform them as soon as possible. Ensure the credibility of the packages by using the MD5 checksum methodology. If you are installing software, do not use the root account unless you are absolutely sure of the package contents. Keep your system moving at the speed of Linux!

CHAPTER 13

Securing the Network

We all have run into the problem of how to implement network security. In many cases, security is a low-key issue that's seldom talked about and grossly underestimated. So why is security so important? For one thing, humans are curious—and although this has led to the development of things such as light bulbs and telegraph communications, it also has helped create dynamite and other types of explosives. Now take the curious nature of humans, connect a few computers, and tell someone he has only limited access to certain things—pow! Security risk city.

Until recently, security breaches were thought to occur only on big sites, such as university computer networks, military sites, or places that contained information that is "worth something." That school of thought must be re-addressed. With the volume of computers on the Internet or a local intranet, the potential of breaches and compromises also increases. The average computer user will not worry about what he or she can or cannot get it to, just as long as normal use is not hindered.

Determining Your Vulnerabilities

Determining your vulnerabilities is crucial to the installation of SuSE Linux. Some of the keys are these factors. Will you allow the following?

- Internal network connectivity (intranet, VPN)
- External network connectivity (WAN, Internet)
- Inbound network connections (telnet, ftp, ssh)
- File sharing (NFS, Samba)
- Limited access to network (via login = user/group level)
- Router Applications

- IP-Masquerading, Firewall Solutions
- Proxy Servers
- Web-based commerce solutions (e-commerce)

If you find yourself in any of these categories, you face a potential security risk. This chapter discusses the generalities of security and also shows how SuSE has provided an excellent security package in version 6.3. You'll also learn about tools to use and programs that will help monitor your system on a daily, weekly, and monthly basis.

You can take this security issue with a grain of salt and assume that break-ins and compromises happen to someone else. You may say, "I have nothing to offer a system cracker." You will be surprised to find, however, that this very mentality is what those who breach insecure systems are looking for.

Vulnerabilities on the Internet

The Internet, the Information Superhighway, is like the Autobahn in Europe. Few speed laws are enforced, and the limit of your thrill is based on the car you own and your driving skills and technique. It also reminds me of the highways in California—a seemingly endless piece of roadway that is inhabited by the meek and the unmerciful.

As a reminder, I want to recount an example of extreme vulnerability. Some of you may have memories of this incident on November 2, 1988.

A young man named Robert Morris, Jr., a grad student in computer science at Cornell University, used his talents and ability to write an experimental, self-replicating, self-propagating program called a *worm* and unleashed it into the Internet. Morris fast discovered that the program was replicating and reinfecting machines at a faster rate than he had anticipated—a "glitch" in the program. In a short period of time, many machines at locations around the country either crashed or became "zombied" out. Morris quickly realized what was happening and contacted a friend at Harvard University to discuss some type of solution. Eventually, they sent an anonymous message from Harvard over the network, instructing programmers how to kill the worm and prevent reinfection. Due to the effect of the worm, the network route was clogged and these messages did not get through until it was too late. Computers were affected at many sites, including universities, military sites, and medical research facilities.

The cost estimates of dealing with the worm at network locations ranged from a few hundred dollars to $40,000–$50,000.

The worm exploited certain weaknesses in sendmail, the mail transport agent used by nearly every UNIX system on the Internet. This incident was proof that security was an issue not to be taken lightly. The biggest problems found in basic security audits are these:

- System configuration problems (which inadvertently allow user access)
- Unpatched software applications that allow unwanted or unintended user access

Today's business facts indicate that Internet connectivity may be pivotal to a company's success. This yields the answer to at least one of the previous issues. Httpd and email

servers are being set up without the assistance of qualified security professionals. The race to get sites up and running is phenomenal—and in this race, true security preparation is not considered. This weaknesses is what system crackers (I will refer to them as "black hats") are looking for. On the opposite side of this security issue are a community of hackers whose goal is to find the breaks, holes, and vulnerabilities in the software before a system is compromised (these are the "white hats"). Performing tests prior to a compromise is key because the noted vulnerability can be fixed, thus tightening security. Though sometimes the lines seem blurred between black and white, it's a benefit to have this type of security enforcement system in place.

Through your experience, you've found that Linux is not affected by the normal virus attacks that hinder other operating systems currently in use. It's a warm, fuzzy feeling when you can sit back and not worry while everyone else is either infected or waiting for it. Be warned, though: Linux in general is not affected by virus attacks, but plenty of other things will cause chaos in system operations.

Consider this scenario: With improper configuration, a "black hat" can connect to your system, gain root account access, install software (root kit) that will allow him or her to return to your machine unhindered, and then will utilize your machine as a source of attack or anything else he or she may want to do. Now think of this in multiplied numbers, as boxes go online all over the world unsecured—scary!

When your machine is "owned" (by the intruder), the system can be used to hide *trojan* programs—Remote Access Trojans (RATs) that are able to map keystokes or password files and then mail them to a specific email address. Or, your system could be used in a coordinated network attack. Imagine trying to explain to your service provider why you are not the culprit in a distributed network attack that emanated from you IP address.



NOTE

The statistics speak for themselves: Seventeen new trojan-type programs were written in 1997, approximately 81 were built in 1998, and, at last count, 156 new trojans were created in 1999.

The list in Table 15.1 shows examples of existing trojans and the ports they communicate from. In most cases, the lower ports are used by trojans, which steal passwords and either mail the passwords to attackers or hide them in a predetermined, compromised directory.

The problem associated with RATs or password-stealing trojans is detection: Keeping a constant vigil on the system logs and knowing what ports are open could be your only safeguard. All the trojans listed here do not affect UNIX/Linux systems—my intent is to show the amount of effort put behind network compromise and intrusion. If you operate in a mixed-platform environment, this might help you identify other possible problem areas.

Table 13.1 Trojan Programs and Their Communication Ports

Port	Program
21	Back Construction, Blade Runner, Doly Trojan, Fore, FTP Trojan, Invisible FTP, Larva, WebEx, WinCrash
23	Tiny Telnet Server (TTS)
25	Ajan, Antigen, Email Password Sender, Haebu Coceda (Naebi), Happy 99, Kuang2, ProMail Trojan, Shtrilitz, Stealth, Tapiras, Terminator, WinPC, WinSpy
31	Agent 31, Hackers Paradise, Masters Paradise
41	Deep Throat
59	DMSetup
79	Firehotcker
80	Executor, RingZero
99	Hidden Port
110	ProMail Trojan
113	Kazimas
119	Happy 99
121	JammerKillah
421	TCP Wrappers
456	Hackers Paradise
531	Rasmin
555	Ini-Killer, NeTAdmin, Phase Zero, Stealth Spy
666	Attack FTP, Back Construction, Cain & Abel, Satanz Backdoor, ServeU, Shadow Phyre
911	Dark Shadow
999	Deep Throat, WinSatan
1001	Silencer, WebEx
1010	Doly Trojan
1011	Doly Trojan
1012	Doly Trojan
1015	Doly Trojan
1024	NetSpy
1042	Bla
1045	Rasmin
1090	Xtreme
1170	Psyber Stream Server, Streaming Audio Trojan Voice
1234	Ultors Trojan
1243	BackDoor-G, SubSeven, SubSeven Apocalypse
1245	VooDoo Doll
1269	Mavericks Matrix
1349 (UDP)	BO DLL
1492	FTP99CMP
1509	Psyber Streaming Server
1600	Shivka-Burka

Port	Program
1807	SpySender
1981	Shockrave
1999	BackDoor, TransScout
2000	TransScout
2001	TransScout
2001	Trojan Cow
2002	TransScout
2003	TransScout
2004	TransScout
2005	TransScout
2023	Ripper
2115	Bugs
2140	Deep Throat, The Invasor
2155	Illusion Mailer
2283	HVL Rat5
2565	Striker
2583	WinCrash
2600	Digital RootBeer
2801	Phineas Phucker
2989 (UDP)	RAT
3024	WinCrash
3128	RingZero
3129	Masters Paradise
3150	Deep Throat, The Invasor
3459	Eclipse 2000
3700	Portal of Doom
3791	Eclypse
3801 (UDP)	Eclypse
4092	WinCrash
4321	BoBo
4567	File Nail
4590	ICQTrojan
5000	Bubbel, Back Door Setup, Sockets de Troie
5001	Back Door Setup, Sockets de Troie
5011	One of the Last Trojans (OOTLT)
5031	NetMetro
5321	Firehotcker
5400	Blade Runner, Back Construction
5401	Blade Runner, Back Construction
5402	Blade Runner, Back Construction
5550	Xtcp
5512	Illusion Mailer

continues

Table 13.1 continued

Port	Program
5555	ServeMe
5556	BO Facil
5557	BO Facil
5569	Robo-Hack
5742	WinCrash
6400	The Thing
6669	Vampyre
6670	Deep Throat
6771	Deep Throat
6776	BackDoor-G, SubSeven
6939	Indoctrination
6969	GateCrasher, Priority, IRC 3
6970	GateCrasher
7000	Remote Grab, Kazimas
7300	NetMonitor
7301	NetMonitor
7306	NetMonitor
7307	NetMonitor
7308	NetMonitor
7789	Back Door Setup, ICKiller
8080	RingZero
9400	InCommand
9872	Portal of Doom
9873	Portal of Doom
9874	Portal of Doom
9875	Portal of Doom
9876	Cyber Attacker
9878	TransScout
9989	iNi-Killer
10067 (UDP)	Portal of Doom
10101	BrainSpy
10167 (UDP)	Portal of Doom
10520	Acid Shivers
10607	Coma
11000	Senna Spy
11223	Progenic Trojan
12076	Gjamer
12223	Hack '99 KeyLogger
12345	GabanBus, NetBus, Pie Bill Gates, X-bill
12346	GabanBus, NetBus, X-bill
12361	Whack-a-mole
12362	Whack-a-mole

Port	Program
12631	WhackJob
13000	Senna Spy
16969	Priority
17300	Kuang2 The Virus
20000	Millennium
20001	Millennium
20034	NetBus 2 Pro
20203	Logged
21544	GirlFriend
22222	Prosiak
23456	Evil FTP, Ugly FTP, Whack Job
23476	Donald Dick
23477	Donald Dick
26274 (UDP)	Delta Source
29891 (UDP)	The Unexplained
30029	AOL Trojan
30100	NetSphere
30101	NetSphere
30102	NetSphere
30303	Sockets de Troie
30999	Kuang2
31336	Bo Whack
31337	Baron Night, BO client, BO2, Bo Facil
31337 (UDP)	BackFire, Back Orifice, DeepBO
31338	NetSpy DK
31338 (UDP)	Back Orifice, DeepBO
31339	NetSpy DK
31666	BOWhack
31785	Hack'a'Tack
31787	Hack'a'Tack
31788	Hack'a'Tack
31789 (UDP)	Hack'a'Tack
31791 (UDP)	Hack'a'Tack
31792	Hack'a'Tack
33333	Prosiak
33911	Spirit 2001a
34324	BigGluck, TN
40412	The Spy
40421	Agent 40421, Masters Paradise
40422	Masters Paradise
40423	Masters Paradise
40426	Masters Paradise

continues

Table 13.1 continued

Port	Program
47262 (UDP)	Delta Source
50505	Sockets de Troie
50766	Fore, Schwindler
53001	Remote Windows Shutdown
54320	Back Orifice 2000
54321	School Bus
54321 (UDP)	Back Orifice 2000
60000	Deep Throat
61466	Telecommando
65000	Devi

In December 1999, The CERT Coordination Center (part of the Survival Systems Initiative at the Software Engineering Institute, located at Carnegie Mellon University) identified a new type of trojan attack. The Distributed Denial of Service (DDos) attack is a trojan-based attack taken to a new level. For more information, point your Web browser to `http://www.cert.org/incident_notes/IN-99-07.html` or `http://www.icsa.net/html/communities/ddos/index.shtml`.

There are other types of threats that can come from non-local (remote) sources on the Internet. Buffer overflow attacks are considered an effective way to compromise security on Linux platforms. The problem is due to errors in C program files. You will notice that existing applications may require a patch due to vulnerability to a buffer overflow attack. For more details on how buffer overflows can effect your system, see `http://www.infosecuritymag.com/may99/news.htm`, and also, `http://www.insecure.org/stf/smashstack.txt`.

These are just a few examples to show that security is a big issue. Your successful Internet presence will come at a cost: a watchful eye and a knack for detail.

Here are some other URLs that can provide helpful information on how to keep your system secure:

Linux security HOWTO: `http://www.linuxdoc.org/HOWTO/Security-HOWTO.html`
Linux security home page: http://www.ecst.csuchico.edu/~jtmurphy/
Bugtraq: `http://www.mit.edu:8008/menelaus/bt/`
Cert's documentation on trojan horses: `http://www.cert.org/advisories/CA-99-02-Trojan-Horses.html`

Vulnerabilities on the Local Intranet

The greatest security threat does not come from the outside world. If you happen to support some type of Web presence, hopefully you will not allow undeterred traffic into your network. The simple checks and balances inherent in SuSE Linux, such as pass-

word requirements and the like, slow the rate of outside intrusion. Consider the internal network, however: Users are assigned passwords and have prolonged access to the network. This is where the highest potential threat comes from.

The issue of password protection is important. Some people will receive a password and, for convenience, will write it down and put it in a "safe place," such as the bottom of the keyboard, or there could be multiple users who each know the others' password. This will easily break down good security measures—I have worked in places where security has been compromised for these very reasons.

The worst-case scenario may be similar to this: Your local intranet computer systems previously thought to be isolated from the outside world become accessible through carelessness and back doors. Your R/D department develops a major new product in secret using the internal network, but "black hats" creep in, sniff around, find the new unreleased product, snatch the information, and either sell the details to the competition or blackmail the enterprise.

Before the end of this chapter, I will give you some options to look at, and also more resources that will guide you in the area of intranet security. First, though, let's look at a few areas of concern, starting with the internal threats.

Internal Vulnerabilities

Internal vulnerabilities usually are generated through unverified information exchanges. It could be easier to get a password to a system from a live person rather than trying to gain network access and crack the password file. If the intruder uses this method, he has realized that people, in general, want to be helpful—if given the opportunity, they usually will try to help out as much as possible.

Consider a scenario like this: A caller contacts an account holder (employee) and represents himself as tech support. He then states that the call is only a courtesy, that some files will be moved during the night shift and that his files are affected. The caller may ask if this if going to pose a problem for them; the employee answers no, and the caller indicates that file permissions will have to be reset and then subtlety inquires and or requests the username and password. In an attempt to help, the person divulges this information, and your systems are now compromised. This is called "social engineering"—getting someone to open the front door is always better than breaking in.

Another internal threat is an employee or account holder that has been terminated; they may have left under less than agreeable circumstances, or they might feel that they must exact some type of revenge. If proper steps are not taken, your system will once again become compromised from inside.

There are other means of internal compromises, including "shoulder surfing"—observing keystrokes and other input by another user. For more on the basic mentality of social engineering concepts, point your browser to `http://packetstorm.securfy.com/docs/social-engineering/soc_eng2.html`.

Analyzing the Network

Every machine on a network may need some type of tweaking and tuning to make sure that it is security–ready. Even the best systems can use a little work—nothing is perfect.

Consider this example: A couple years ago, I had an account with a Web-hosting provider that included a shell account, by which I could use ftp to upload my HTML files onto the server. I enjoyed the service and the account because I was using a Linux-based machine. I somehow gained access to the / directory, however—I was surprised that I could do so, and I graciously returned to my /home directory, desiring to stay in good standing with the provider and feeling like I had just peeked through someone's bedroom window. Several days later, nudged by curiosity, I attempted to try the same thing—I was now unable to gain access to /bin, /sbin and /, as I had done previously. If I had been an intruder, I could have "owned" the server on my first visit. Obviously, at the time of my account startup, the file permissions were not set correctly. I had signed up for service shortly after the service provider had gone online.

The responses from tech support were almost nonexistent, which indicated that they were almost completely overwhelmed with work. It was evident that after my accidental break-in, someone was now able to watch and monitor administrative logs and resolve the permissions problem, thereby limiting my access to critical files. I can see this happening in a lot of places, particularly high-volume Web-hosting providers that allow thousand of shell accounts on their servers, possibly missing vital configuration specs that could give root access to a supposed friendly account.

How do you eliminate problems such as these? How can you analyze your network and make it harder for someone to compromise it? Computers help to automate tasks, but a good majority of people have been lulled to sleep, believing that their firewalls and automatic security auditing tools make their networks impenetrable. Each new break-in proves them wrong. Then why is there a continued lack of security?

If you own a house, you have responsibilities such as landscaping, plumbing, and general maintenance duties. You may well hire a gardener, a plumber, and a handyman to do the work. The cost would be significant, but if you wanted the best for your home, you'd invest. Or, you might be pretty good with tools and get a good-sized toolbox and the right books so that when something breaks, you can fix it. If you are serious about security, you'll do one of two things: use all the tools that come with SuSE Linux and stay briefed on security issues, or hire someone to do it. If neither choice is made, then your house is destined to be ruined in some way.

Using Other Methods

If you have decided to take matters into your own hands, here are some pointers.

The first thing you should do is expose all the weak passwords on your system. SuSE come with a program called John the Ripper, which is similar to the famous Crack program, although with a number of different features. To crack your password file, simply issue this command (as root or superuser):

```
john /etc/<password file name>
```

I created some bogus users on my system, with weak passwords, and ran John to decipher the passwords. The result is shown in the Figure 13.1.

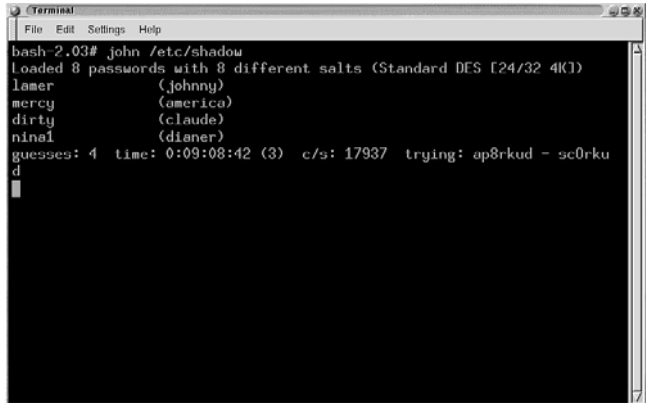


Figure 13.1

"John" Password Cracking Utility.

The first password was cracked in approximately 30 seconds. Good passwords work; weak ones don't!

SuSE includes another tool that is a preemptive password verifier. If you have a doubt concerning a user password, utilize the program called vpass. It will use cracklib to qualify an okay password, or it will return "ERRNO <reason>" and let you know whether the password is too short, all lowercase, or what not. Issue this command:

```
echo <user name>  | vpass -u
```

This small program is worth its weight in gold. When system admins have a moment during the day, checking a few user passwords and emailing them to correct the situation is called proactive security.

Your next move will be to check for root compromise capability. Although SuSE sets the permissions in the post-install, you want to find out if there is any way that someone on the inside can obtain root access. You'll need to pick up Tiger Analytical Research Assistant (TARA) for this. This is an upgrade to the TAMU tiger program, which is a set of scripts that will scan your system looking for security problems, especially root access problems. This program is not included in the SuSE distribution, so you'll have to download it from `http://home.arc.com/tara/index.html`.

After you have downloaded the tarball, extract it into a secure directory, preferably not root. Run `make` and `make install`, and then run the program. You might never know what is open game on your system unless you really look for it, and TARA will help identify potential threat areas. (See Figure 13.2.)

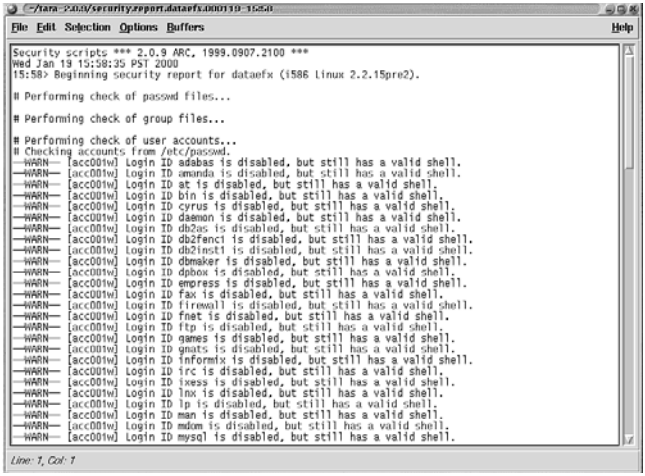


Figure 13.2

TARA Security Checking Program Output.

This is a great program for system administrators; you can add TARA to cron and have it run at a particular time and examine the logs in detail.

Last but not least in your quest to secure your system, I recommend running the Tripwire program prior to going online. This tool compares properties of designated files and directories against information stored in a previously generated database. The key to this utility is to keep the tripwire_database file on inaccessible media. This eliminates the possibility of tampering by crackers. To set up and run Tripwire, take a look at `/usr/doc/packages/tripwire/README.FIRST`.

NOTE

YaST1 will give you the option to check for weak passwords. In the system administration menu under Change Configuration File, answering yes to the PASSWD_USE_CRACKLIB option checks all password that are assigned through the cracklib library. This could help limit the use of weak passwords.

When you've taken these measures, you will have a reasonably safe internal working environment. If you have more than one machine, you should perform these actions on all of them before going online.

Showing another side of YaST's incredible flexibility is the system administration submenu selection for security settings. You may opt to use this tool when setting file permissions on a systemwide basis. (See Figure 13.3.)

Other settings can be modified by using this menu as well. This tool may or may not be what you need—that depends on how fine-grained you want permission settings.

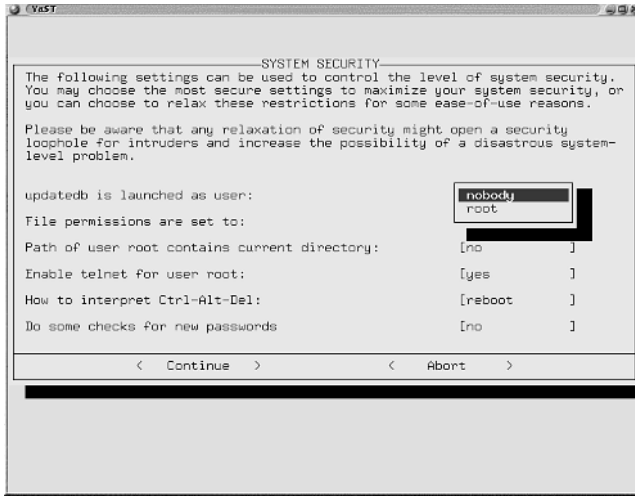


Figure 13.3

YaST1 Security Settings Selection.

Enforcing Network Security

If you are the sole user on your network, the task of enforcing network security is as critical as if you had 100 users. The habits that you build will be either an asset or a liability. Security is a state of mind rather than a state of operation. If you are successful in enforcing good security, then you most likely will keep a well-tuned network.

SuSE Linux 6.3 comes with a package called firewal. The package is not a true firewall per se—it's more like a smart packet filter built with the ipchains program. To get this working, you'll need to read the instructions in the /etc/rc.firewall and edit the file accordingly. This will give you a pretty nice start on getting a full-fledged, custom firewall script set up for industrial strength use.

SuSE upgraded the startup script, so everything initializes at boot time; check your current version with the command:

```
rpm -q firewal
```

The current version is firewal-1.4. If you experience problems with firewall initialization during bootup, download the update package at `http://suse.de/en/support/download/updates/63_update.html`.

To stay on top of security issues in general, check out the site `http://xforce.iss.net`.

Besides the fact that you may be protected by a firewall, if it becomes necessary to allow some type of connection to your network, you will have to establish trust. A trusted relation can be built by using ssh (secure shell), or PKI (public key infrastructure) methods. Rather than allowing any type of connection, this trust method works on

the theory of verified authorization exchange. SuSE Linux configures ssh connectivity for you on the post-install.

Breaking into Your Own Network

Breaking into your own network sounds strange, doesn't it? Well, consider the fact that I get port-scanned at least once a week and that my firewall logs shows two to three unauthorized connection attempts per night—somebody is always checking to see if the doors are unlatched. Some choices must be made: Will I wait for someone to find a hole in my security, or will I perform some advanced network diagnostics myself? I'd feel better finding the weak spots and correcting them rather than feeling violated by some unknown individual(s).

The first thing you'll need to do is "blueprint" your own network. Again, consider the analogy of a house: Blueprinting will indicate the doorways, roof, and internal structure of a building. Before you can effectively protect your system, you must know the overall picture. This can be accomplished with several tools, such as port-scanners and analyzing tool kits. SuSE Linux contains both types of programs. Although I can in no way fully explain or detail the functionality of these tools, I will attempt to briefly show the simplicity of use.

WARNING

The tools discussed here are for testing *your own* network integrity. They are highly advanced scanners and vulnerability checking programs. Never scan another network without receiving permission from the network administrator; port scanning is considered a prelude to a possible break-in.

Port Scanner

Port scanners are well-known tools of the network trade, so I will dispense with the basics and get right to the point.

The port scanner included is one of the best on the Open Source market. nmap is a highly advanced port-scanning utility written by Fyodor that has won recognition and awards in the computer industry. Its ease of use and versatility is nothing short of amazing. This tool can be used from the CLI and also has a couple graphical front ends available. Kmap is the KDE interface for nmap, which makes using it a little easier. Alternatively, you can obtain the standard X Window-based interface at `http://128.196.109.24/nmap/dist/nmap-frontend-2.3BETA13-1.i386.rpm`.

You can use this to check all your open ports and close them accordingly. Services that run arbitrarily are doors waiting to be opened. Figure 13.4 shows the output from nmap on one of my local machines.

I recommend upgrading nmap to V 2.3BETA13, due to the cleaned-up code and front-end features. Download it from `http://www.insecure.org/nmap/dist`.

The nmap Web site also has a wealth of information on nmap operations; see `http://www.insecure.org`.



Figure 13.4

Example output from nmap Portscanning Tool.

Network Analyzer

SAINT is a spin-off of the famous SATAN (for Security Administrator Tool for Analyzing Networks) network analyzing toolkit. Two security experts, Dan Farmer and Wietse Venema, developed this program that probes for weakness in each responding network system. The vulnerabilities uncovered then are reported to the security admin in an HTML format onscreen. (See Figure 13.5.)

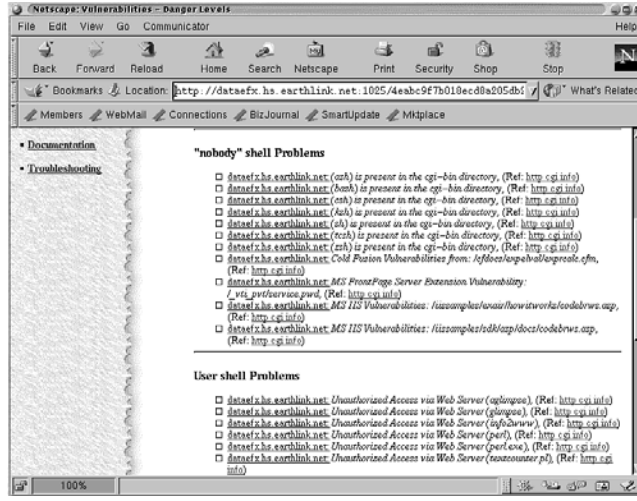


Figure 13.5

SAINT Vulnerability Analyzer Results.

SAINT utilizes all the features inherent in SATAN and then enhances those capabilities by delegating the task to different modules contained in the toolkit. When you use this tool, make sure that you are not scanning another subdomain. For a detailed tutorial, see `http://www.wwdsi.com`.

The latest SAINT version, 1.5.1BETA1, was released in early January 2000. If you want to stay on the leading edge of security, grab a copy from the previous URL. This version runs without a hitch in SuSE Linux.

Security Risks to Avoid

The main idea in security is fire prevention rather than damage control. The best way to stay secure is to limit the internal threats by laying down specific policies and procedures regarding network activity. Check and prune access levels, and run a tiger program to alert you of any internal changes. By the way, SuSE also comes with a package called seccheck, which is a tiger-type program. This program mails you daily, weekly, and monthly security check notices. (Although I prefer TARA, you'll have to figure out which best suits your needs.) Keep in mind that the Web contains information about how to gain root access to UNIX/Linux systems, so take special care with internal users.

The key to solving the social engineering compromise is to keep close tabs on usernames and passwords, changing passwords frequently. Educate others so that the important information is not released without some type verification. Establish a policy and procedure for information exchange that is secure. If an account is terminated, delete the user and all associated files (not just the /home directory).

Closing all unused ports and turning off services that are not required will help batten down the hatches as well. SuSE Linux comes with a hardening script, called `harden_suse`. This script is interactive; you will be greeted with the screen shown in Figure 13.6.

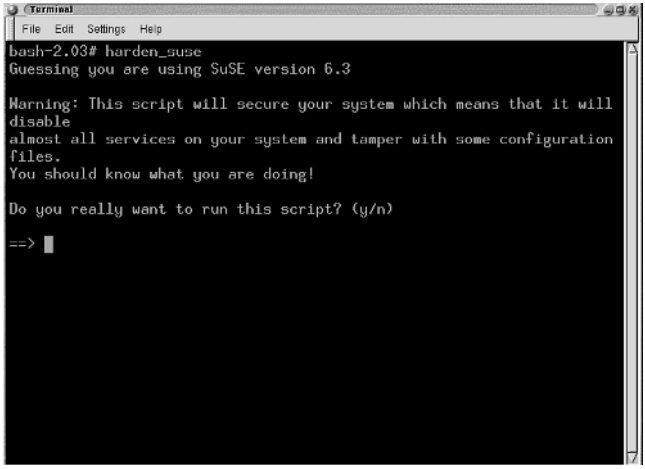


Figure 13.6

`harden_suse` *system hardening script.*

Take caution in the use of `harden_suse` because it can disable most of your services that are required for daily use.

Run scheduled and unscheduled network security audits with the scanning and vulnerability toolkits. You will have a better outlook and more confidence if you make these a part of your normal tasks.

There are a few other ways to monitor your system: One of these is to use SuSE's tempwatch program, which logs temporary files that may be opened by an intruder during a compromise. You can do roughly the same thing as temp-watch by issuing this command:

```
lsof | less
```

This displays all currently open files through the pager utility called less.

Reporting Security Issues

How will you know when your system has been compromised? A daily examination of the logs is essential. If you don't monitor the logs, intruders can have free reign. If the intruder is good, the traces of activity might not be seen in a one-time incident. You, or whoever is in charge of security, should become acquainted with your system so that small changes in system operation will alert you. SuSE gives you the capability to decrease or increase your mail frequency. Go to YaST1, choose Change Configuration File, select MAIL, and then answer with All. This mails all the system logs to the specified user (root). You can also use logcheck or logwatch, which are available at `http://www.rpmfind.net`.

You will need to have a point of contact (that may be you) and a game plan to recover from a compromise. It's also a good thing to build a relationship with your local ISP in case you need help tracking down an intruder. A host of resources on the Web will help prepare you for an attack or compromise. One good site is NetworkICE, located at `http://www.8lgm.org/`.

Resolving Security Compromises

This could be the hardest issue to address in the security arena. When your network has been compromised, what do you do?

The first thing that might come to mind is tracking down the intruder and retaliating in some manner. It may be harder to prove who did it and where it came from, unless the cracker is careless or you have noted his presence and have allowed him to build a track record that will stand up in court. (Of course, that's only an option if that person happens to be in the same country as you reside.)

Recovering from a compromise is complex, and sometimes it's impossible without salvaging files and sanitizing the system with a reinstall. If trojan programs have been deployed in your network and you are not sure what to do, call for help. An excellent coverage of a root_compromise is detailed by the Department of Defense at `http://www.cert.mil/techtips/root_compromise.htm`. Or, visit the FBI Computer Crimes Web page, at `http://www.fbi.gov/nipc/compcrime.htm`.

I hope that you'll never have to use these URLs. In reality, however, anything can happen.

Security Summary

In this chapter, you learned that security is a mind-set, not a way of operation. Seal up all the holes in the house, from the inside, out. Set up your picket fence (firewall), and go around every now and then and rattle the doors and windows to make sure they're shut. If you do this faithfully, it's like leaving a light on and the stereo playing in the den. If you don't do your part, the burglars will do theirs.

SuSE Linux is moving forward in the security realm and is providing more tools than most other mainline distributions. Figure 13.7 shows a few specialized tools for network security.

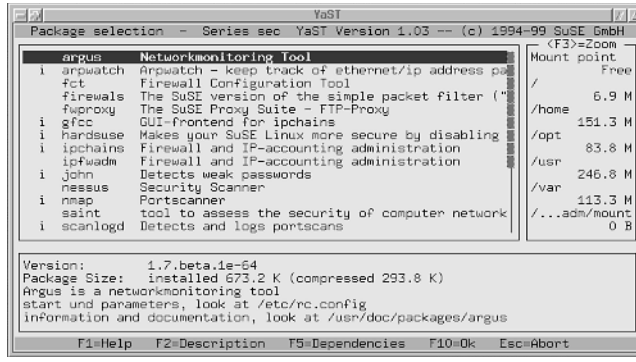


Figure 13.7

Network Security Tool selection list.

Security will always be an issue—don't allow that to cloud the wonderful experience of running SuSE, though. Have fun!

APPENDIX A

Finding Help Online

Linux came to life on the Internet. For that very reason, you will find an abundance of documentation and help available online. SuSE Linux also provides an extensive database of support-related questions. The beauty of the support database (SDB) is that you can install the relatively complete system, along with the htdig search engine, on your machine. The SDB package is available on the CD-ROM.

The SuSE Web site contain up-to-date information on problems encountered during installation. The database expands as the distribution is used more. SuSE also has a pretty active support group, and it seems as though the information obtained through online, email and telephone technical support problem resolution has been transferred to the Web site database. This site is the best place to find additional information on special problems or subjects not discussed in this book.

In every Linux distribution, there are known problems. For version 6.3 problems, go to `http://sdb.suse.de/sdb/en/html/bugs63.html`.

Other support offerings can be accessed from the main page of the Web site, at `http://www.suse.com`.

Community involvement for the Linux kernel and application development is strong. You will have to find your channel of communication, whether a users group meeting or your favorite IRC channel. You might already be involved in some capacity as well; isolation can be a terrible thing when you are in the midst of a problem that you cannot seem to fix.

Join a Mailing List

By joining a mailing list, you can keep up to date on the growth of Linux. I subscribe to a few mailing lists that target problems on Linux; two of my favorites are Basic Linux Training, at `blt@onlist.com`, and Linux Admins, at `linux-admin@vger.rutgers.edu`.

You can even configure your NNTP service to download the current mailing to lists such as `comp.os.linux.answers`, `comp.os.linux.help`, and `comp.os.linux.security`. This is just for starters, of course: The smoke finally has cleared from the incredible explosion of Linux interest, and you can find information in quite a few places.

SuSE offers a number of mailing lists to which you can subscribe. These lists include subjects such as announcements, database applications, and general user discussions. You can subscribe to the list by going to `http://www.suse.com/Maillist/index_en.html`, and choosing one or more of the current lists.

If you're interested in kernel development, you can try `http://www.kt.linuxcare.com`. Or, if you are interested in research and engineering, try Scientific Application on Linux, at `http://gd/tuwien.ac.at:8050/index.shtml`. Likewise, if you are into cluster building, you can browse the Beowulf Project, at `http://www.beowulf.org`. In addition, the Linux in Hi-Performance Computing Web site is located at `http://www.cs.berkeley.edu/~mdw/linux/hpc/hpc.html`.

Some other options for online help come in the form of Internet relay chat (IRC) channels on the Internet. SuSE does not have a dedicated IRC channel, so if you prefer to get a live answer from someone, be prepared to sift through a bunch of other stuff. Some options include servers such as `undernet.org` and `irc.openprojects.org`, as well as a host of others. I seldom visit the IRC channels such as `#linux`, or `#linpeople`, but when push comes to shove, I'll bite the bullet to get some information. Don't get me wrong—I have a lot of respect for the operators on the IRC, but I find the flurry of information way beyond my pace.

Here's the catch: If you use IRC, understand that your specific question may or may not be answered. This might not necessarily be because everyone is ignoring you, though—it could be that no one has the answer. I have seen quite a few people leave the channel with the thought, "They just didn't want to help me!" Still, I've solved a couple problems by simply watching the questions and answers of others users. Give it a try.

Linux Users Groups

Linux users groups (LUG) are springing up all across the United States and Europe. These groups are organized for the furtherance of the Linux operating system and for general users. These meetings cover topics such as networking, firewall configurations, and desktop utilities. The goal is for the community to share in teaching itself, which also fosters a sense of unity.

Unfortunately, including a list of users groups would take up more than a hundred pages. Instead, this section gives you a few good URLs to browse to find a group near you. Most LUG's have a local meeting place and a mailing list dedicated to its members. Contact the group closest to you, and get to know some of the people in your community that are involved in Linux.

For starters, visit the one sponsored by the LinuxMall, at `http://linuxnews.com/programs/usergrp/list`. Another good site is `http://www.linux.com/lug/search.phtml`. This URL leads to a search engine—just type in your location information, and it will indicate the closest LUG in your area. The Yahoo! LUG listing also is available at `http://clubs.yahoo.com/clubs/suselinuxusers`.

Becoming a part of the Linux community is what stirs the interest of other users—find a group in your area and you'll see what I mean. I have used Linux for nearly 4 years, and I find that I am always learning and growing. Finding help also usually means finding friends.

Some LUGs (including the one through `http://www.ecn.purdue.edu/PLUG/Installfest/`) have *installfests*, times when you can bring your software and hardware and get everything running—well, as close as possible.

One LUG that I had the chance to attend was putting together special interest groups (SIGs) for programming, security, and other pertinent issues. Joining a LUG will not only give you a better idea of how to use Linux on a personal basis, but it also might give you a chance to meet people who are using Linux in a much larger environment.

Additional Reference Resources

The SuSE Web site, at `http://www.suse.com`, includes more than just installation information. The database and online help system found here are representative of a strong service background. You will find solutions to problems that date back to version 4.2, both answers for problems that seem isolated and tricky ones that are fairly common.

Information on the LVM software and also the ReiserFS filesystem is documented in the database. Booting problems, PCMCIA diagnostics, and many other time-consuming procedures have been worked out as well, and simple solutions are provided in the support text. On the whole, SuSE has put the right foot forward in the area of support documentation.

The Linux Documentation Project (LDP) Web site, located at `http://metalab.unc.edu/LDP`, is the largest repository of information pertaining to the Linux operating system. The included HOWTOs contain the collective knowledge of the community, and this LDP is supported by users of Linux. If you take a moment to read the LDP Manifesto (at `http://www.linuxdoc.org/manifesto.html`), you'll have a clearer understanding of who does what and how.

You also can use the LDP to identify and resolve problems. In addition to the SuSE support database, this might be a critical stop on your information trail. This vast range of subject material can be helpful in getting your system running properly.

The Linux Weekly News site, `http://lwn.net`, also brings the important Linux issues to the forefront. This site is a great resource when you are searching for current trends and subjects. This site also maintains some interesting links that span the Linux world.

Linux Today, at `http://www.linuxtoday.com`, is always jammed-packed with the latest Linux news. This site is sure to have something for you, including recent Linux job opportunities, security posts, and weekly summary. You can have all the major postings and summaries sent to you by email (as I do), for convenience.

The most visible (and most referenced) site is Slashdot, at `http://slashdot.org`. This Web site is a stockpile of current information that also features editorials found nowhere else on the Internet. It is a large news site that focuses on concerns within the Open Source computing community.

The LinuxJournal, at `http://www.linuxjournal.com`, is another wonderful place to visit to browse and to search for current or past articles. I subscribe to the magazine also, and I'm always impressed on how much the staff writers are able to cover in one issue. You can search the archives based on keywords and subjects.

System administrators should look to `http://www.samag.com`. This site is focused toward UNIX system administrators, but some of the information and article are relevant to Linux as well, including the Linux Rookery. Take a look at this site if you are into big iron stuff.

You can keep yourself up to date by watching `http://www.linux.org.uk/cgi-bin/portaloo/`. This portal site has links to several high traffic sites that can help you sift out information you need. There's also `http://www.linuxlinks.com/` and the portal page at Penn State, `http://www.math.psu.edu/morris/deptpage/portals.html`.

Of course, new portals and Web sites pop up every day. The rapid increase in popularity will continue to compel this phenomenal explosion called Linux.

The resources on the Internet, mailing lists, and IRC channels are not the only places to find good help, of course. You might find other means or avenues of assistance on your own. Whatever you do, have fun!

APPENDIX B

Troubleshooting SuSE Linux

Under real-world conditions, things fail. Systems that are designed to work don't. There is a good chance that your SuSE Linux installation has gone smoothly and you've run into no snags at all; I tip my hat to you and wish you the best on your continued Linux journey.

On the other hand you may have hit a problem that has stalled your installation or some component on your machine will not configure properly. The information that follows is by no means a "cure-all"; it is a brief discussion of possible problems that can arise during or after your install.

I have attempted to give you some "primer" information on troubleshooting and also various online references that may help you. I have found that no matter how big the problem is, if I stay focused and use logic, I can whittle the problem down to size. Persistence pays.

Large Hard Disks

Large hard disks have posed a problem for quite some time, particularly because the 1024 cylinder limit of the BIOS has hindered quite a few people. Fortunately, some resolutions are on the horizon.

If you have attempted an install and rebooted your machine only to find the boot process stopping at L, LI, or LIL?/LIL-, remain calm. A few things can cause this. The simplest problem could be that the /boot/boot.b file might need to be moved; the worst problem could be a disk media failure.

The 1024 cylinder limitation is a classic problem and with the ever-increasing number of large disks (+8.4GB) on the market,

the need to address this type of problem grows on a daily basis. There is an article on LBA (Logical Block addressing), which remaps your disk geometry to alleviate the cylinder limitation problem. See `http://freebsd.yourbox.net/tutorials/multi-os/limits.html` for details. LBA must be supported in your computers for BIOS to work.

As a solution to the 1024 cylinder problem, the LILO program has been enhanced. LILO version 0.21.4.2 now supports "big disks." The 1024-cylinder limit has been removed by a patch that uses the EDD bios extensions and supports up to 2TB disks. For more details on how this will solve your problems, see `http://www.freshmeat.net`.

SCSI Hard Disks

SCSI disks should not give you a problem, but if they do, here are a couple ways out. With the upgraded linuxrc, it's no longer required to choose a kernel; the install program does it for you. If you find yourself booting from a disk, you might want to follow this procedure in making the boot disk.

Follow the steps in Chapter 2, "Installing SuSE Linux," and create a standard SCSI boot disk. This SCSI kernel image might not suit your exact needs, so find the correct image type and issue the following commands (from a DOS prompt):

```
D:> dosutils\rawrite\rawrite disks\scsi01 (standard image)
D:> copy suse\images\scsixx.ikr a:\linux
```

This will create the primary SCSI image and then overwrite any additional information in the copy process. Remember that you must make the standard image first.

Another problem could occur when installing on a system with a SCSI disk. If you have an Adaptec 2940 controller and the system hangs on bootup (that is, it will not initialize ID0), yet it starts with no problem with the boot disk, the problem could lie in the controller BIOS. If your Adaptec controller has a BIOS version of 1.23, switch off the Sync-Negotiating feature of the controllers' BIOS. Always check your final settings.

Zip and Jaz Drives

Zip and Jaz drives utilize the parallel port (ppa) drivers in the kernel. As long as the driver is compiled and loaded properly, you should experience few problems. Do not try to use a Zip drive and printer at the same time, however. The Zip drive is recognized as a /dev/sda (SCSI device), and the printer requires the lp module to operate. If you plan to use a Zip or a Jaz drive in addition to a printer, you must have two available LPT ports. You also will have to arrange the module loading so that the ppa module loads prior to the lp module. For more information on this, see `http://sdb.suse.de/sdb/en/html/mantel_1.html`. For the Jaz drive HOWTO, point your browser to `http://www.linuxdoc.org/HOWTO/Jaz-Drive-HOWTO.html`.

Video Cards

Video cards have been and always will be a rough issue. Until the video card manufacturers figure out that Linux is a viable solution, support will be slim.

There are a few cards to watch out for—they may work, or they may not. The SIS 6326, for one, has a few problems with the stepping feature during the graphic acceleration process. Fortunately, SuSE has a remedy for it—point your browser to `http://sdb.suse.de/sdb/en/html/cep_sis_6326.html`.

Also read through the text for information on how to edit your config file. If you're unsure of the card you are using, you can always check the hardware database at `http://cdb.suse.de/cdb_english.html` to see if it is supported. For the details on other card(s) problems refer to `http://sdb.suse.de/sdb/en/html/unsupp_graphic.html`. The information you find there is the most current that SuSE has online.

Sound Cards

Sound cards represent a special problem because they are touchy and finicky when it comes to configuration. You can diagnose the hardware aspect of this problem with a few commands, which will let you know whether the system recognizes the card. Issue the following at the command line:

```
dmseg | less
```

This will enable you to examine the boot process and to verify that the card was recognized by the system. You can use the command

```
tail /var/log/messages
```

to get the same results.

If you have verified that your card works (in Windows or DOS), be sure to properly document the running settings. Linux should use the same I/O ports and IRQ as when used in Windows or DOS.

You can issue the following command to show the current available IRQs on the system:

```
cat /proc/interrupts
```

Check your sound card specs. This will help you establish whether the IRQ is being used by another device.

Issue this command to show all the I/O port addresses:

```
cat /proc/ioports
```

This also can help you determine a conflict of resources problem. Make sure that you are referencing the sound card manufacturer's information.

This command lists all the used dma channels:

```
cat /proc/dma
```

You can find the sound HOWTO at `http://www.linuxdoc.org/HOWTO/Sound-HOWTO.html#toc4`.

Network Interface Cards

Network interface cards (NICs) are a snap to configure, and most of the drivers are available in the kernel that is installed by SuSE Linux. One problem that I have found is with PCI card configuration. This is an isolated case, but I will note it for the sake of others. The BIOS setting on older machines that were initially built when the 10Tbase ISA cards were popular might require a change in PCI settings. PCI cards are allocated IRQs and I/Os automatically. This means that if the PCI setting are left on legacy compatibility, the system either will recognize the card but will not allocate an IRQ for it, or it will assign IRQ0 or 255, which are not valid addresses. When the setting are adjusted to PCI PnP compatibility, the problem should go away. More detailed information can be obtained at `http://cesdis.gsfc.nasa.gov/linux/misc/irq-conflict.html`. Or, check out the database at `http://sdb.suse.de/cqi-bin/sdbsearch_en.cqu?stichwort=PCI`.

If you have problems with an ISA card(s), you'll need to use the same `cat` commands outlined in the previous Sound Card section. This will help you determine if you have system conflicts or other problems. Again, you need to have the card specifications in front of you.

Laptops and Notebooks

If you are a laptop user and have installed SuSE, you might find a few things different—notably, PCMCIA configuration problems. If you face a situation that requires diagnosis, this could help.

Linuxrc automatically probes for a PCMCIA device on post-install and attempts to set up the device at that time. You will also be asked which network device you want to use; obviously, you will choose PCMCIA, and YaST will attempt to configure the PCMCIA device. When you restart the machine, the boot process fails to start the PCMCIA device, possibly stating "eth0 device not found," or the device initializes and then etc/route fails. The problem is caused because Linuxrc and YaST are trying to do the same job. Unknown to the other, each program has tried to configure the PCMCIA device.

You must return to YaST and select Network Configuration and then deselect the PCMCIA device that YaST set up (under base configuration). Do not remove any figures already there. Next you will need to edit the /etc/pcmcia/network.opts file—SuSE Linux looks here for its network information regarding PCMCIA devices. Add your IP address, netmask, broadcast, and network information. Also add your hostname and nameservers to complete the task.

If you experience a hang when the system is booting and tries to initialize the PCMCIA device, check out this support tip at `http://sdb.suse.de/sdb/en/html/mneden_6.3_pcmcia-start.html`.

You'll also have to go without sound on your laptop due to the current PCI technology gap. The standard sound drivers and configuration tools are for ISA type PnP. If you are willing to try a development kernel version, this could solve your sound-less dilemma—it did for me. I run the 2.3.34 version kernel, and the drivers necessary for my particular card are included in the kernel package. Do some research to find out the manufacturer of the card and the specifications. You might want to refer to the Open Sound Web site at `http://www.4front-tech.com/linux.html`.

Modems

Diagnosing a failed ppp connection can be an irritation, but the wvdial program that comes with SuSE is pretty versatile. If the tool cannot autoconfigure your modem, then there's a good chance that you have a failed modem or a resource conflict. Use the `cat` commands to verify the IRQ and the I/O port, and make sure that you have determined where the modem is supposed to be located at ttyS0 and ttyS1, which correspond to the Windows setting of COM1 and COM2. If the modem works on another operating system, verify the COM port and use the same one under SuSE Linux (ttyS0/S1/S2). You can find an excellent detailed HOWTO on modems at `http://www.linuxdoc.org/HOWTO/Modem-HOWTO.html`.

In most cases, a modem could be your only means to connect a network to the Internet. Make sure that the modem(s) you are using are Linux compatible, whether internal, or external. Until recently, the idea of using a Winmodem, (this type of modem is usually cheaper in price due to its operating characteristics, software driven, which consumes valuable CPU cycles in the process) was out the question. Now the idea that Winmodems are not for Linux is diminishing. A few sites are dedicated to developing Open source drivers for Winmodems. The Linmodem site, at `http://www.linmodems.org/`, goes in-depth on the rationale of use and some of the hurdles that must be overcome. Or, try the Winmodems site, at `http://www.o2.net/~gromitko/winmodem.html`, for some interesting highlights on the deficiencies surrounding Winmodems. Additional information is there as well on compatibility and available drivers.

Troubleshooting Software Problems

Software problems can crop up anytime. Although most Open Source software packages are quite usable in the normal configuration, sometime you will have to verify contents, adjust makefile configurations to suit your system(s), and possibly trace shared libraries to find a problem.

If you run into problems with software operation, try using the RPM package manager to help (if the software is .rpm packaged). Use this command to verify the installation status of all .rpm packages:

```
rpm -Va
```

This is a good idea to do immediately after installing the system because it will ensure that all packages are installed and will warn you of missing files and those that fail the dependency checks.

In some cases you will want to install or remove a package, but RPM will complain that dependencies will not be met or will be broken. This can happen when the package that you are installing is looking for a specific file name and version, and although your system might have the file, it could be an updated version. This also can happen when you are removing a package that is linked to another file or library. If you are sure that the file exists and is current, use this command to install or upgrade:

```
rpm –Uvh  --nodeps <filename.rpm>
```

Use this command to remove a package with broken dependencies:

```
rpm –e  --nodeps <filename.rpm>
```

If you decide to remove a package and it breaks some dependencies, note that it could cause problems for the other application, and in some instances it will render the associated program useless. Be sure that if you use the `--nodeps` command, replacement of the primary package will be mandatory.

Many other .rpm commands can be accessed by typing this at the command line:

```
man rpm
```

Resolving Package Dependency Problems

If you happen to run into a situation in which the software cannot be installed due to a dependency problem, the RPM program should complain and tell you what the failed component(s) are. The trick is finding the right solution without trying to browse the whole Web. You can find this type of information on the rpmfind.net Web site, `http://www.rpmfind.net`. When you look at the package selections, they will indicate which files and libraries are supplied and also the files that are required (prerequisite) for the package to work on the system. For further diagnostics, you can use this command:

```
ldd <option> | <filename>
```

For more information on how to trace linked libraries, issue this command:

```
man ldd
```

Internet Connectivity Problems

If you are using SuSE Linux, odds are that you will be in some type of network environment. Whether that is a dial-up connection to the Internet or a full-time 24x7 aDSL connection, somehow, somewhere you're connected.

The small office/home office (SOHO) is becoming increasingly popular. You might have several computers that you want to share a single connection to the Internet. IP (IPChains) masquerading could be the simple answer, as you learned in Chapter 10,

"Managing the Network Setup." If you decide not to use the firewalling capabilities (packet filtering) in SuSE, you still can use the masquerading features of IP Chains.

Issue the following commands to activate IP Chains on a dial-up connection device ppp0:

```
ipchains -P forward DENY
ipchains -A forward -i ppp0 -j MASQ
echo 1 > /proc/sys/net/ipv4/ip_forward
```

Issue these commands on machines connected with Ethernet card defined as eth0:

```
ipchains -P forward DENY
ipchains -A forward -i eth0 -j MASQ
echo 1 > /proc/sys/net/ipv4/ip_forward
```

For additional resources on IP Chains and masquerading, refer to the HOWTO documents at `http://www.linuxdoc.org/HOWTO/IPCHAINS-HOWTO.html`.

Firewalling could be your only option, in this often hostile environment. Packet filtering can be enabled easily (see Chapter 11). Any further discussion of firewall(s) is outside the scope of this text. Refer to these resources for more information:

```
http://metalab.unc.edu/LDP/HOWTO/Firewall-HOWTO.html
http://sites.inka.de/sites/lina/freefire-l/index.en.html
http://www.rustcorp.com/linux/ipchains/
http://fwtk.netimages.com/main.html
http://www.obtuse.com/juniper/
http://www.ifi.unizh.ch/ikm/SINUS/firewall/
```

Sound Card Driver Problems

The sound card drivers included with SuSE Linux are provided by ALSA. The list below indicates some of the supported sound cards and chipset types.

The list details the sound card interface types, which includes PCM (pulse code modulation) for digital sound reproduction from an analog signal, mixer for blending and modifying sound, and MIDI which is a protocol that lets MIDI instruments and sequencers (or computers running sequencer-type software) talk to each other. The SYNTH feature (synthesizer) enable electrical signals to be interpreted as sounds.

Supporting all these elements of sound reproduction is amazing, and ALSA is expanding their project to support more sound.

CHIPSET: AMD InterWave
SOUND CARD: Gravis UltraSound Plug & Play
SOUND CARD: Dynasonic 3-D
SOUND CARD: STB Sound Rage 32
SOUND CARD: UltraSound 32-Pro (STB)
SOUND CARD: MED3210
INTERFACE: MIXER,PCM,MIDI,SYNTH

CHIPSET: Gravis UltraSound MAX
INTERFACE: MIXER,PCM,MIDI,SYNTH

CHIPSET: Gravis UltraSound Extreme
INTERFACE: MIXER,PCM,MIDI,SYNTH

CHIPSET: Gravis UltraSound Classic/ACE
INTERFACE: MIXER,PCM,SYNTH

CHIPSET: ESS AudioDrive ESx688
INTERFACE: MIXER,PCM,MIDI(1688)

CHIPSET: SoundBlaster 1.0/2.0/Pro
INTERFACE: MIXER (Pro only),PCM,MIDI

CHIPSET: SoundBlaster 16/AWE
INTERFACE: MIXER,PCM,MIDI

CHIPSET: Yamaha OPL3-SA2/SA3
INTERFACE: MIXER,PCM,MIDI

CHIPSET: OAK Mozart
INTERFACE: MIXER,PCM

CHIPSET: S3 SonicVibes PCI
SOUND CARD: Schubert 32 PCI (PINE)
INTERFACE: MIXER,PCM,MIDI

CHIPSET: Ensoniq AudioPCI (ES1370,ES1371)
SOUND CARD: SoundBlaster PCI 64
SOUND CARD: SoundBlaster PCI 128
INTERFACE: MIXER,PCM,MIDI

CHIPSET: Cirrus Logic / Crystal Semiconductors CS4232/CS4232A
INTERFACE: MIXER,PCM,MIDI

CHIPSET: Cirrus Logic / Crystal Semiconductors
CS4235/CS4236/CS4236B/CS4237B/CS4238B/CS4239
SOUND CARD: Turtle Beach Malibu
INTERFACE: MIXER,PCM,MIDI

CHIPSET: Cirrus Logic / Crystal Semiconductors
CS4610/CS4612/CS4615/CS4280
INTERFACE: MIXER,PCM

CHIPSET: ESS Solo-1 ES1938
INTERFACE: MIXER,PCM

CHIPSET: ESS ES18XX
INTERFACE: MIXER,PCM,MIDI

CHIPSET: OPTi 82C9xx
SOUND CARD: Audio 16 Pro EPC-SOUN9301 (82C930 based)
SOUND CARD: ExpertColor MED-3931 v2.0 (82C931 based)
SOUND CARD: ExpertMedia Sound 16 MED-1600 (82C928 based - AD1848)
SOUND CARD: Mozart S601206-G (OTI601 based - CS4231)
SOUND CARD: Sound Player S-928 (82C928 based - AD1848)
INTERFACE: MIXER,PCM,OPL,MIDI

CHIPSET: Trident 4DWave DX/NX
SOUND CARD: Best Union Miss Melody 4DWave PCI
SOUND CARD: HIS 4DWave PCI
SOUND CARD: Warpspeed ONSpeed 4DWave PCI
SOUND CARD: AzTech PCI 64-Q3D
SOUND CARD: Addonics SV 750
SOUND CARD: CHIC True Sound 4Dwave
SOUND CARD: Shark Predator4D-PCI
SOUND CARD: Jaton SonicWave 4D
SOUND CARD: Hoontech SoundTrack Digital 4DWave NX
INTERFACE: MIXER,PCM,MIDI

CHIPSET: ForteMedia FM801
SOUND CARD: DT-0398
INTERFACE: MIXER,PCM,MIDI

CHIPSET: SGI Indy (HAL2)
INTERFACE: PCM

CHIPSET: Turtle Beach WaveFront
SOUND CARD: Tropez Plus (Tropez+)
SOUND CARD: Tropez
SOUND CARD: Maui (models with CS4232; others use OPTi 16 which is not handled)
INTERFACE: MIXER,PCM,MIDI,OPL,SYNTH_MIDI,HWDEP

CHIPSET: C-Media CMI8330
INTERFACE: MIXER,PCM

CHIPSET: Avance Logic ALS100/ALS120
INTERFACE: MIXER,PCM,MIDI

CHIPSET: Diamond Technologies DT-0197H
INTERFACE: MIXER,PCM,MIDI

CHIPSET: Aztech Sound Galaxy
INTERFACE: MIXER,PCM,MIDI

CHIPSET: MOTU MidiTimePiece AV multiport MIDI interface
INTERFACE: MIDI

CHIPSET: EMU10K1
SOUND CARD: Sound Blaster Live!
SOUND CARD: Sound Blaster PCI 512
SOUND CARD: E-mu APS
INTERFACE: MIXER,PCM,MIDI,SYNTH_MIDI

CHIPSET: RME Digi9652 (Hammerfall, Hammerfall light)
INTERFACE: PCM

The complexity of setting up a stubborn sound card is indescribable. A few things beside the `cat` commands have been known to work, however.

If you run into installation problems and want to get your sound up and running as fast as possible, see the NOWTO (not HOWTO) at `http://www.screamingweb.com/IDP/HOWTO/mini/Alsa-sound-2.html`, or `http://www.alsa-project.org/~valentyn/Alsa-sound-mini-HOWTO-4.html`.

Boot Loader Problems

LILO (LInuxLOader) is a group of programs designed to move information to and from hard disk boot sectors. This information is kept in a configuration file whose sole purpose is to supply lilo with data to write to the boot sector. Remember that LILO does not perform any function at boot time. The mounts implied by the configuration file need to be in effect only when the BIOS calls LILO, not at boot time. The default configuration file is /etc/lilo.conf.

If LILO is not installed and configured properly, you could be stuck with a machine that will not boot up.

Here are some of the reasons that LILO will not fully initialize:

- **L**—Indicates that the BIOS loaded and started LILO. The second stage of the process is incapable of loading because /boot/boot.b is not found. This is caused by a physical problem with the disk or because the disk parameters are incorrect (geometry).
- **LI**—Indicates that the second stage of the boot process has been recognized (/boot/boot.b file located), but it might be incorrectly positioned (that is, the 1024 cylinder limit could be exceeded). This also is caused when files are moved or renewed and LILO is not reinstalled.
- **LIL**—Indicates that the second stage of the boot process started, but the descriptor table from the map file cannot be accessed. Out-of-parameter positioning of the boot file or a physical disk geometry problem exists.
- **LIL?**—Indicates that the first and second stage of the boot has been recognized, but the address at which it is located is incorrect. Again, the problem is caused when the boot files are moved or renewed without reinstalling LILO, or it could be caused by a failed disk.
- **LIL-**—Indicates that the descriptor table in the map file could be corrupted, or that files were moved or renewed without invoking the `lilo` command to reinstall the map file.

If any of these happen to you, do not panic. The built-in rescue system on the SuSE Linux CD will help you. Reset your BIOS to boot to the CD-ROM. After Linuxrc starts, go to the main menu and select Boot Installed System. This rescue system provides a kernel image to boot up, and it allows you to get back into your system and make repairs if necessary. This rescue system will not save you from a boot/boot.b file located beyond the 1024 cylinder boundary, though. If you don't have a bootable CD-ROM, then the boot disk will serve the same purpose. Additional detail on boot problems can be found at `http://sdb.suse.de/sdb/en/html/keylist.LILO.html` and `http://linux.com/support/newsitem.phtml?sid=82&aid=6316`.

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